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Self-Service Fare Collection on Buses in Portland, OR

Daniel Wagner

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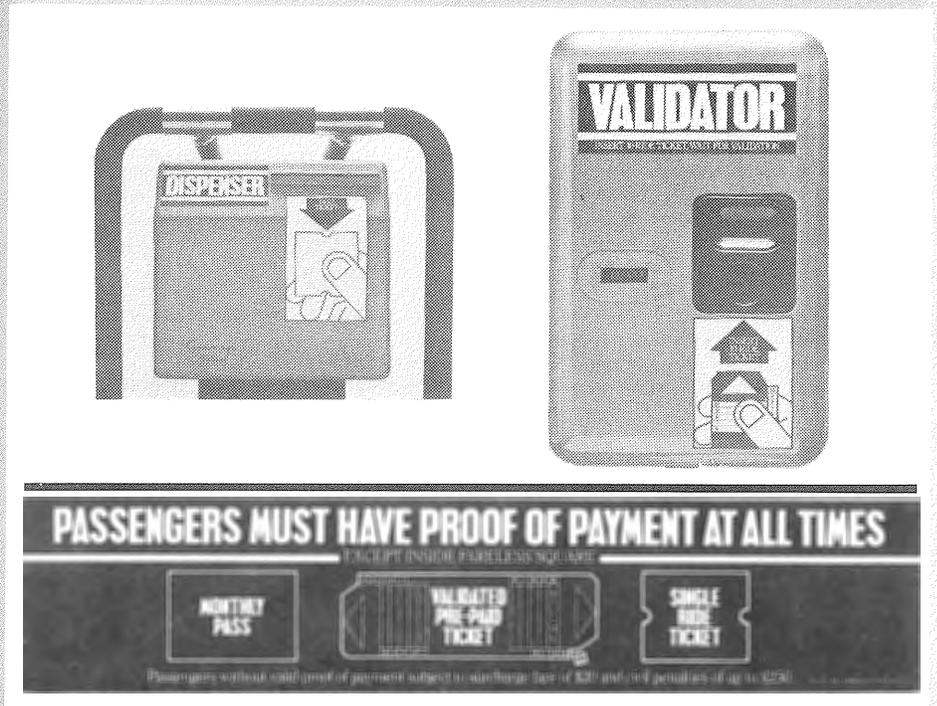
U.S. Department
of Transportation

**Urban Mass
Transportation
Administration**

Self-Service Fare Collection on Buses in Portland, OR

UMTA/TSC Evaluation Series

Final Report
September 1986



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16. Abstract <p>In 1980, the Urban Mass Transportation Administration (UMTA) awarded grants to the Tri-County Metropolitan Transportation District (TRI-MET) to implement self-service fare collection (SSFC) on its bus system. TRI-MET, the transit authority serving Portland, Oregon, is the second authority in the United States to use SSFC and the first to use it on buses. TRI-MET expected SSFC to improve bus productivity, facilitate distance-based fares, and reduce fare evasion.</p> <p>In September 1982, TRI-MET implemented SSFC on the buses. In April 1984, TRI-MET reinstated conventional fare collection for all boardings except those from 6:00 a.m. to 6:30 p.m. weekdays in Fareless Square (Downtown Portland).</p> <p>The experience in Portland illustrates the difficulty of SSFC enforcement when compared with enforcement of traffic or parking laws. Problems encountered with SSFC on buses in Portland included increased fare evasion, high enforcement costs, no productivity improvements, low surcharge/fine collections, overburdened courts, and increased vandalism. These problems need to be overcome before SSFC can be successful on buses in other U.S. cities.</p>					
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PREFACE

Peat, Marwick, Mitchell & Co. prepared the Self-Service Fare Collection on Buses in Portland, Oregon report as part of the Service and Methods Demonstration Program sponsored by the Urban Mass Transportation Administration (UMTA). This report documents and evaluates the self-service fare collection demonstration of the Tri-County Metropolitan Transportation District (TRI-MET) in Portland, Oregon.

The authors of the report were Daniel Wagner, Wesley Harper, and Oliver Schueftan. Mark Hallenbeck assisted in processing and analyzing survey data, and Raymond Ellis provided general project guidance and review.

Peat Marwick acknowledges and thanks TRI-MET staff members Kathryn Hatch, Phil Selinger, Gerald Fox, Dave LaFollette, Twila Jacobsen, Gina Whitehill, Doug Wentworth, Jody Fischer, and Diane Geldon for their assistance, cooperation, and support throughout the evaluation.

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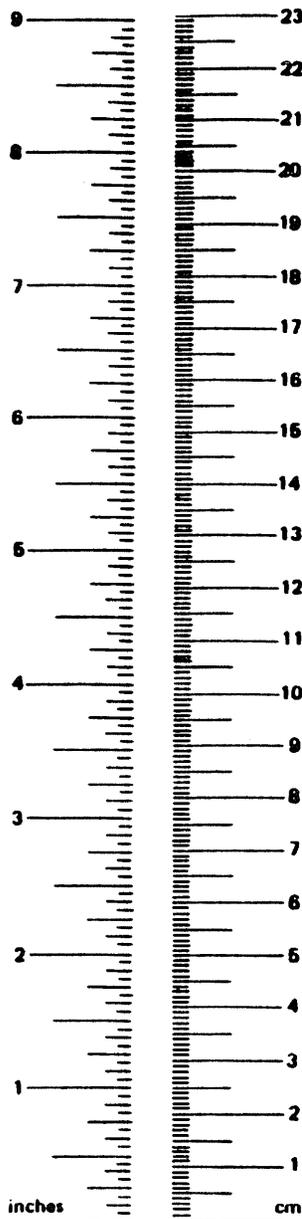
The authors wholeheartedly thank Juanita Combs who provided invaluable assistance in editing the report and managing report production. We also thank Peat Marwick's word processing, editorial assistant, and art staffs for their assistance.

METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
AREA				
in ²	square inches	6.5	square centimeters	cm ²
ft ²	square feet	0.09	square meters	m ²
yd ²	square yards	0.8	square meters	m ²
mi ²	square miles	2.6	square kilometers	km ²
	acres	0.4	hectares	ha
MASS (weight)				
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
VOLUME				
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft ³	cubic feet	0.03	cubic meters	m ³
yd ³	cubic yards	0.76	cubic meters	m ³
TEMPERATURE (exact)				
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

^a 1 in. = 2.54 cm (exactly). For other exact conversions and more detail tables see NBS Misc. Publ. 286, Units of Weight and Measures. Price \$2.25 SD Catalog No. C13 10 286.



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
AREA				
cm ²	square centimeters	0.16	square inches	in ²
m ²	square meters	1.2	square yards	yd ²
km ²	square kilometers	0.4	square miles	mi ²
ha	hectares (10,000 m ²)	2.5	acres	
MASS (weight)				
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
VOLUME				
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m ³	cubic meters	36	cubic feet	ft ³
m ³	cubic meters	1.3	cubic yards	yd ³
TEMPERATURE (exact)				
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F

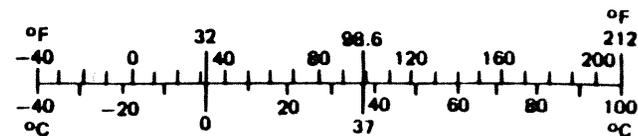


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SYMBOLS AND ABBREVIATIONS

ADB	Advanced Design Bus
ADD	Advanced Driver Development
B/O	Bad Order
CETA	Comprehensive Educational Training Act
CETIP	City and Eastside Transit Improvement Program
CPI	Consumer Price Index
CPU	Central Processing Unit
METRO	Metropolitan Service District
MSA	Metropolitan Statistical Area
MTDB	Metropolitan Transit Development Board
SMD	Service and Methods Demonstration Program
SSFC	Self-Service Fare Collection
TRI-MET	Tri-County Metropolitan Transportation District
TSC	Transportation Systems Center
UMTA	Urban Mass Transportation Administration
U.S. DOT	Department of Transportation

EXECUTIVE SUMMARY

In 1980, the Urban Mass Transportation Administration (UMTA) awarded grants to the Tri-County Metropolitan Transportation District (TRI-MET) to implement self-service fare collection (SSFC) on its bus system. TRI-MET is the transit authority serving Portland, Oregon.

UMTA's objective in awarding the grant was to determine whether SSFC, which is used in Europe, could be successful in the United States. TRI-MET became the second authority in the United States to use SSFC and the first to use it on buses.

SSFC DESCRIPTION

Under SSFC, the passenger is responsible for paying the fare and for possessing proof of payment. The passenger determines and pays the fare, typically using automatic ticket validating or vending machines. The validated ticket or receipt is proof of payment. On rail systems, entry is unimpeded by turnstiles or station personnel; on bus or streetcar systems, entry and exit is through any door.

Special fare inspectors roam the system to check for fare evasion and to issue a fine or warning to any passenger whose proof of payment indicates improper fare payment. Such fare enforcement, in which only a portion of system patrons are checked, is an important element in SSFC.

LOCAL OBJECTIVES

Among TRI-MET's numerous objectives for SSFC were:

- . Ensure the productive use of transit vehicles. At the time of the grant application, TRI-MET planned to build a light rail line and to purchase 125 articulated buses. TRI-MET expected that SSFC would reduce passenger boarding and alighting time on these high capacity vehicles.
- . Improve the equity of the fare structure. Before SSFC, when TRI-MET had a 3-zone system, persons attending public hearings had voiced concern about high base fares being needed to subsidize long-distance trips. TRI-MET believed that conventional fare collection could not accommodate additional zones in Portland because zone fares were difficult for bus operators to enforce. Before SSFC, zone fare evasion accounted for 51 percent of evasions. With SSFC, TRI-MET instituted a 5-zone system which allowed better distance-based pricing.

- . Reduce fare evasion, particularly zone-fare avoidance and pass forging. TRI-MET found that zone-fare avoidance and pass forging were difficult for drivers to control and hoped that SSFC would reduce these fare evasions.

SSFC IN PORTLAND

In Portland, passengers had a choice of four forms of payment: passes, ten-ride tickets, 24-hour tickets, or cash. Passengers using passes had all-door entry on all buses. Passengers using tickets boarded through the front doors of standard buses and through all three doors of articulated buses. Passengers paying cash boarded through the front doors.

TRI-MET used on-board SSFC equipment with three components: dispensers, validators, and controllers. Passengers paying cash deposited their fares in the fare box, then drivers activated the dispensers to issue cash receipts. Passengers with tickets inserted their tickets in the validators which cut off a corner of the ticket and printed fare data on it. Controllers, which contained the electronic gear which operated the validators and dispensers, were used to set the time, fare zone, and route information that was printed on tickets and cash receipts.

TRI-MET deployed fare inspectors to board buses and inspect for valid proof of payment. A passenger without a valid proof of payment was either warned or given a fare surcharge of \$20.

SSFC EQUIPMENT PERFORMANCE

The SSFC equipment, as designed, proved unreliable. Performance was way below levels specified in TRI-MET's procurement contract. The vendor and TRI-MET made several modifications to the SSFC equipment. These modifications failed to improve performance appreciably. The reason for the poor reliability was that the equipment went through extensive modifications to operate on U.S. buses and to meet TRI-MET's needs.

MARKETING AND TRAINING

TRI-MET implemented SSFC and a new zone system, new crosstown service, and a base fare increase, all at the same time. SSFC implementation was handled in this way to maximize marketing dollars spent, to minimize confusing the public, and to limit the number of training programs needed for the public

and employees. TRI-MET and its marketing agency therefore developed a comprehensive marketing and training program that covered all the service changes. The manager of public information and marketing for SSFC directed the program.

TRI-MET conducted the marketing and training program in three phases:

- . program development and employee training;
- . public education; and
- . final marketing effort.

TRI-MET was successful in alerting most people to the service changes. Ninety percent of riders and 76 percent of non-riders said they were aware of TRI-MET service changes. The large percentage of non-riders who were aware of TRI-MET is impressive, considering their non-use of the service. TRI-MET was successful not only in creating a general awareness of service changes, but also in relaying specific information. This information was needed to teach people how to use SSFC.

LEGAL ISSUES

Initially, TRI-MET considered modeling its fare evasion ordinances after traffic ordinances that allow for citations for violators. TRI-MET decided against this approach for two reasons:

- o Oregon law allowed only sworn police officers to issue citations, and TRI-MET wanted the fare inspectors to be customer-service personnel, not transit police.
- o County prosecutors and court administrators discouraged TRI-MET from issuing citations because the court docket was already overloaded.

Instead, TRI-MET levied a "surcharge fare" to fare evaders. The surcharge fare, which was not a fine, was a category of a regular TRI-MET fare. Fare evaders who did not pay the surcharge after several billings were taken to small claims court.

TRI-MET eventually amended its original ordinance to allow citation issuance. TRI-MET experienced problems with passengers who (1) evaded fares repeatedly, (2) provided false names and addresses, and (3) left the bus during inspections. The original

fare evasion ordinance could not effectively deter these tactics because the only actions permitted were issuing surcharge fares and suing fare evaders in small claims court. TRI-MET amended the ordinance after reaching an agreement with the district court for prosecuting fare evaders.

The amended ordinance allowed TRI-MET police to issue citations to offenders and allowed TRI-MET to conduct civil prosecutions of fare evaders and passengers who provided false identification.

ENFORCEMENT

Inspectors usually worked in groups of two. One inspector boarded the bus through the front door, and the other boarded through the back door. They then announced the inspection. A passenger without a valid proof of payment was asked for identification. Inspectors suspecting that the passenger provided false identification or was a repeat offender called for a passenger check, using two-way radios. Operators were stationed at computer terminals with on-line access to the surcharge data base. Inspectors explained TRI-MET's fare policy to all passengers without proof of payment.

Inspectors apprehending repeat offenders with four or more outstanding surcharges called TRI-MET police who issued citations. Repeat offenders found with two outstanding citations were arrested. From November 1983 through May 1985, TRI-MET police arrested approximately ten repeat offenders.

INSPECTION EXPERIENCE

TRI-MET's inspection rate averaged 2.9 percent, and inspections per person-hour averaged 20 passengers. TRI-MET's inspection rate was higher than European rates of 2 percent but half the targeted 6 percent. Inspections per person-hour also were less than the projected 36 passengers a person-hour. The reasons for the lower inspection rate and inspections per person-hour were inspections in outlying areas with few buses and low ridership, inspections during off-peak hours and passenger identification checks. Passenger identification checks could take up to a half hour.

The percentage of riders receiving notices and warnings averaged 3.7 and .7 percent, respectively. The number of riders receiving notices averaged 928 a week and those receiving warnings averaged 174 a week.

SURCHARGE COLLECTION

After receiving a notice, the passenger could pay the surcharge fare immediately or mail the surcharge fare to TRI-MET within 20 days. After 20 days, late fees accrued until a total of seven notices are sent and a surcharge of \$60 was reached, at which point the account was referred to a collection agency. The collection agency with TRI-MET's approval referred uncollectable accounts to small claims court if the fare evader had any assets. Small claims court could levy charges up to \$250.

Passengers could appeal surcharges. An appeals administrator reviewed appeals. The administrator upheld appeals only for reasons of faulty equipment, inability to understand English, mental incompetency, and non-residency. Special appeals not covered by these guidelines were referred to an appeals committee or to the chairman of the committee.

COLLECTION EXPERIENCE

TRI-MET had difficulty collecting surcharge notices. As of May 1, 1984, the collection rate of surcharges issued from April through October 1983 was 27 percent. TRI-MET efforts to increase collections had limited success:

- o Of the approximately 30 percent of surcharges turned over to the collection agency, only 5 to 7 percent were collected. TRI-MET said the small size of the surcharges did not make it worthwhile for the collection agency to pursue the accounts aggressively.
- o TRI-MET won judgments against all evaders it took to small claims court. However, from September 1982 through April 1984, only approximately 100 cases out of 54,903 uncollected surcharges were taken to court. TRI-MET only took evaders to small claims court if they had assets. Most evaders with an outstanding surcharge had no assets.
- o TRI-MET began issuing citations in November 1983. The collection rate of citations issued from that time to May 1985 was 91 percent. However, while 22,152 surcharges were issued, only 240 citations were issued during that period.

SSFC OPERATING EFFECTS

TRI-MET expected that SSFC would reduce passenger boarding and alighting time, particularly on articulated buses, by allowing all-doors boarding. If the time savings were large

enough, TRI-MET could operate bus routes with fewer vehicles, thereby resulting in major cost savings. The expectation of cost savings was a major justification for implementing SSFC.

Survey results indicated that SSFC did not reduce bus dwell times. A regression analysis of the survey data showed that, with SSFC, passenger boardings were quicker but passenger alightings were slower. The slower passenger alightings may have been caused by a greater number of conflicts between boarding and alighting passengers under SSFC.

Dwell times during SSFC were influenced by factors other than passenger boardings and alightings. These factors may include malfunctions of SSFC equipment and unfamiliarity of some passengers with using SSFC equipment.

Route dwell time surveys found that total dwell times were relatively short. The average total dwell time per one-way trip for the spring 1982 period (pre-SSFC) was 134.2 seconds during the morning peak and 136.4 seconds during the evening peak. Since TRI-MET did not operate any routes with average peak period headways of less than 5 minutes (300 seconds), dwell time savings of one headway probably could not be realized on any route.

SSFC COSTS

The annual operating costs of SSFC were \$4,661,000 as compared with the annual operating costs of \$1,258,800 for traditional fare collection. SSFC was more than three times more costly to operate than was the traditional fare collection system. The cost estimate does not include the higher vandalism costs of SSFC which TRI-MET was unable to estimate.

The major components of SSFC costs were:

- o Fare evasion. Annual fare evasion losses during SSFC totaled approximately \$1,692,000 as compared with traditional fare collection losses of \$800,000.
- o Enforcement costs. Net annual SSFC enforcement costs (annual enforcement costs less annual surcharge collections) totaled \$1,330,000. Traditional fare collection required no enforcement expenditures.
- o SSFC equipment maintenance costs. Annual costs for SSFC equipment maintenance were \$944,900 as compared with traditional fare collection costs of \$3,900.

ATTITUDES TOWARD SSFC

Overall, a majority of riders (55 percent) considered SSFC better than the prior fare collection system. Only 15 percent

of those responding to the survey considered it worse. The balance thought SSFC was comparable to traditional fare collection.

SSFC was not as popular among bus operators as it was among riders. Only 48 percent of the operators believed that SSFC was better than the prior fare collection system; 36 percent believed it was worse, and 16 percent believed it was the same. The major reasons cited for perceiving SSFC as an improvement were that SSFC made fare collection easier for drivers and passengers and that it improved bus operations. These points were stressed during SSFC training classes. The major reasons cited for perceiving SSFC negatively were increased fare evasion and unreliable fare equipment.

OPERATOR ABSENTEEISM

TRI-MET expected that SSFC would reduce the stress that bus operators experienced when enforcing fares and, as a result, reduce operator absenteeism. However, because of several exogenous factors, the effects of SSFC on operator absenteeism could not be determined.

CONCLUSIONS

According to its proponents, SSFC has the potential to offer productivity savings on bus routes that have high numbers of boarding and alighting passengers. These bus routes are located primarily in large cities. However, many of the problems encountered with SSFC in Portland are problems that probably would occur in most large cities. In summary, in order for SSFC to be successful on buses in other large cities, the following problems which were encountered in the Portland demonstration need to be overcome:

- . increased fare evasion;
- . high enforcement costs;
- . limited potential for productivity improvements;
- . low surcharge/fine collections;
- . overburdened courts; and
- . increased vandalism.

The results of this demonstration suggest that--except for special circumstances--it may be extremely difficult to implement SSFC for urban bus services in the United States.

1. INTRODUCTION

In 1980, the Urban Mass Transportation Administration (UMTA) awarded grants to the Tri-County Metropolitan Transportation District (TRI-MET) to implement self-service fare collection (SSFC) on its bus system. TRI-MET is the transit authority serving Portland, Oregon.

UMTA's objective in awarding the grant was to determine whether SSFC, used in Europe, could be implemented in the United States. TRI-MET became the second authority in the United States to use SSFC and the first to use it on buses.

1.1 SSFC DESCRIPTION

Under SSFC, the passenger is responsible for paying the fare and for possessing a valid ticket or proof of payment. The passenger determines and pays the fare, using automatic ticket validators or dispensers. The validated ticket or receipt is proof of payment. On rail systems, entry is unimpeded by turnstiles or station personnel; on bus or streetcar systems, entry and exit is through any door.

Special fare inspectors roam the system to check for fare evasion and to issue fines to passengers whose tickets or receipts suggest improper fare payment. Such fare enforcement, in which some system patrons are checked, is an important element in SSFC.

Advantages of SSFC are that it has the potential to:

- . Reduce capital costs for new construction of rail systems. Stations can be built without barriers, turnstiles, and complex equipment. Light rail systems that use SSFC can obviate some stations.
- . Facilitate transfers between modes. All riders pay fares once and receive a receipt that is valid for the whole trip on all modes.
- . Facilitate use of variable and distance-based fares. Patrons, instead of drivers, compute fares; and inspectors, instead of drivers, verify fares. This decentralization of fare computation and verification allows fare structures that reflect the cost and value of service. Thus, fare structures can be more equitable.

- . Increase system productivity. Because patrons can board and alight from all doors, the total time spent at a stop (dwell time) may decline and vehicles, particularly high capacity articulated buses and light rail vehicles, can then be used more efficiently. Since the total fleet is sized for peak-hour travel, increased system productivity may enable transit systems to maintain service levels using fewer vehicles or to expand service without increasing the fleet size.
- . Reduce labor costs for rail systems. Rail vehicles can be operated without conductors, and the need for station attendants is reduced. These personnel can be replaced with a smaller number of fare inspectors.
- . Improve fare evasion control. Inspection can be improved and a penalty system can be instituted which can reduce pass forging, fare box short-changing, and zone fare avoidance.
- . Improve system security. The random appearances of fare inspectors may discourage crime on the system.
- . Reduce operator stress and absenteeism. Drivers no longer are responsible for fare enforcement, a stress-related responsibility, so stress associated with it can be reduced. With less stress, operator absenteeism may decrease.
- . Improve passenger comfort. Multi-door loading may achieve a superior distribution of passengers in the vehicles.

Disadvantages to SSFC are that it has the potential to:

- . Increase bus systems' operating costs. Inspectors must be hired.
- . Increase opportunities for fare evasion. Only a percentage of riders can be inspected.
- . Appear complicated to the public. SSFC is new in the United States; the public is not familiar with how it operates.

1.2 SSFC PRIOR EXPERIENCE

In the early 1960s, SSFC was introduced in Switzerland and Germany. It has since been adopted by many European transit systems and is now spreading to other continents. Some European transit systems claim a 10-percent reduction in fleet size requirements as a result of reduced dwell times made possible by

all-doors access.* Most European transit systems estimate only a 1 or 2 percent fare evasion rate. However, higher rates were experienced at the transit system in Albany, New York, which estimated a fare evasion rate of 9.2 percent.**

A few North American transit systems have introduced SSFC:

- . Since 1977, the transit system in Vancouver, British Columbia, has operated a ferry using SSFC. The system is highly satisfactory and in the future may extend to other parts of the transit system.
- . In 1980, the system in Edmonton, Alberta, initiated SSFC on its light rail transit line and plans to extend it to a second light rail line now under construction and to the bus system.
- . Since their openings in 1981, systems in Calgary, Alberta, and San Diego, California, have used SSFC on their light rail transit lines. San Diego's is the first U.S. application of SSFC. San Diego's system reports fare evasion rates of less than one percent.***

Transit systems in other U.S. cities have expressed interest in SSFC, especially systems planning to build light rail transit systems or to operate large fleets of articulated buses. TRI-MET was one of these systems. In February 1980, it applied to UMTA for demonstration and capital assistance grants to implement SSFC on its all-bus system. TRI-MET anticipated extensive use of articulated buses and construction of a light rail line.

* U.S. Department of Transportation, Urban Mass Transportation Administration, Service and Methods Demonstration Program Report, Report No. UMTA-MA-06-0049-81-12, December 1981.

** Ibid. Albany, New York, was the site of a downtown free-fare zone demonstration project which gradually evolved into a driver-monitored honor system of fare collection for outbound trips.

*** Self-Service Fare Collection on the San Diego Trolley, U.S. Department of Transportation, DOT-TSC-UMTA-84-16, May 1984.

1.3 DEMONSTRATION OVERVIEW

In September 1980, UMTA awarded TRI-MET grants totaling \$5,928,290 to implement SSFC. The grant comprised a Service and Methods (SMD) demonstration grant of \$3,118,850 and a capital grant of \$2,809,440. TRI-MET began demonstration planning after the grant was awarded and, in September 1982, implemented SSFC on all its buses.

TRI-MET's SSFC demonstration comprised nine major elements:

- . legal research and ordinance development;
- . equipment procurement;
- . fare prepayment expansion and promotion;
- . zonal fare system expansion;
- . marketing and employee training;
- . operations;
- . fare inspection;
- . surcharge fare billing and collection system development; and
- . program evaluation.

In December 1983, federal funding of the demonstration ended.

1.3.1 SSFC Operation

Passengers had a choice of three forms of payment: passes, tickets, and cash. Passengers using passes or validated 10-ride or 24-hour tickets had all-doors entry on all buses. Passengers using tickets requiring validation boarded through the front doors of standard buses and through all three doors of articulated buses. Passengers using cash boarded through the front door.

TRI-MET used on-board fare collection equipment with three components: dispensers, validators, and controllers. Passengers using cash deposited fares in the fare box; drivers then activated the dispensers to issue tickets. Passengers using 10-ride or 24-hour tickets inserted them in validators which cut off the corner and printed fare data on the front. Controllers contained the electronic gear which operated the other two components.

TRI-MET deployed fare inspectors, generally in teams of two, to board buses and inspect for valid tickets or passes. Passengers without valid proof of payment were given either verbal warnings or fare surcharges of \$20. TRI-MET targeted an inspection level of 6 percent of all passengers. The enforcement role of bus operators was limited to checking cash fares for farebox shortchanging.

1.3.2 Local Objectives

Among TRI-MET's numerous objectives were:

- . Ensure the productive use of transit vehicles. At the time of the grant application, TRI-MET planned to build a light rail line and purchase 125 articulated buses. TRI-MET expected to use these vehicles effectively by reducing passenger boarding and alighting time.
- . Improve operator working conditions and attendance. With operators no longer responsible for monitoring all fare collection, TRI-MET expected operator stress to decrease and therefore working conditions and operator attendance to improve.
- . Improve the equity of the fare structure. Persons attending public hearings had voiced concern about high base fares being needed to subsidize long-distance trips under TRI-MET's pre-demonstration 3-zone system. With SSFC, TRI-MET was able to institute a 5-zone system which allowed better distance-based pricing.
- . Reduce fare evasion, particularly zone-fare avoidance and pass forging. TRI-MET found that zone-fare avoidance and pass forging were difficult for drivers to control and hoped that SSFC would reduce these abuses.
- . Reduce fare collection costs. TRI-MET hoped that the use of prepayment instruments would increase under SSFC. Increased use would reduce money handling costs, particularly if, as expected, dollar bill use for higher fares increased.
- . Simplify fare payment rules for passengers. Before SSFC, passengers always paid when boarding buses on inbound and crosstown routes. On outbound routes from downtown Portland, passengers paid when alighting buses except during the evening peak when passengers paid when boarding buses. During SSFC, passengers always paid when boarding buses.

- . Improve system security. TRI-MET expected that the random appearance of radio-equipped inspectors would increase system security.
- . Improve TRI-MET's public image. At the time of the grant application, public concern over increasing public subsidies to TRI-MET was growing. TRI-MET had a reputation as an innovator because its downtown transit mall, transit transfer stations, and park-and-ride service had proved successful. TRI-MET hoped that its SSFC program would demonstrate its commitment to efficiency and would cultivate its reputation as an innovator.

1.3.3 SMD Objectives

UMTA sponsored the SSFC demonstration in Portland with grants administered by its SMD program. Through its financial support, UMTA (1) tested to see if the general public and transit property personnel accepted SSFC enforcement activities and fare collection equipment; and (2) established accurate estimates of the costs and benefits of SSFC.

1.4 EVALUATION OVERVIEW

This report documents the activities and presents an evaluation of TRI-MET's SSFC project:

- . Documented activities include events leading to the project, project planning, marketing, training, fare collection enforcement, equipment performance, factors affecting the project, and project conclusion.
- . Evaluated issues include the effects on vehicle productivity, operating costs, fare compliance, operator absenteeism, ridership, revenue, and travel behavior; and attitudes of operators, users, and the public.

Sources of data for the report were:

- . surveys before and during SSFC of bus riders and drivers;
- . a panel survey of respondents to the on-board survey;
- . a survey of households during SSFC;
- . studies before and during SSFC of bus dwell and run time;

- . records and operating reports of TRI-MET; and
- . interviews with TRI-MET staff.

Figure 1-1 presents a time line of TRI-MET's extensive data collection activities. Appendix A presents all survey forms.

1.5 ORGANIZATIONAL ROLES

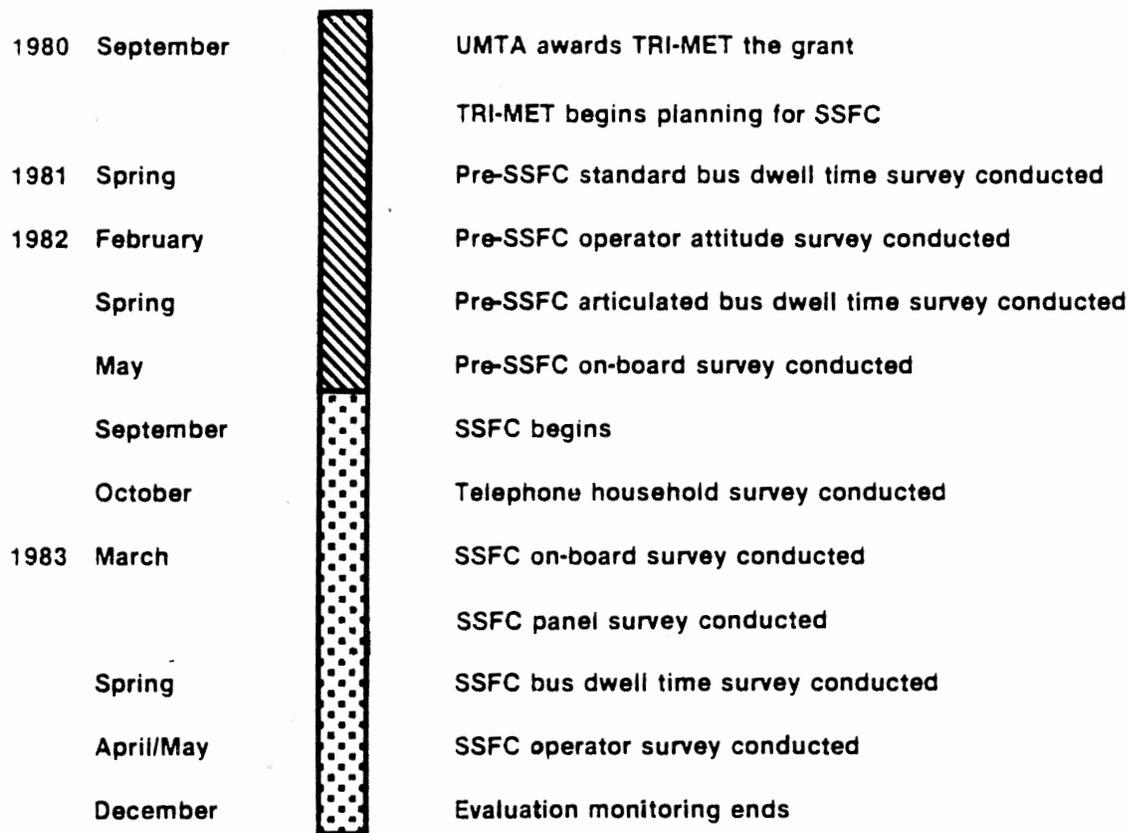
UMTA partially funded TRI-MET's SSFC demonstration through its SMD and capital assistance programs. In addition to UMTA, four agencies participated in the demonstration.

TRI-MET, the grant recipient, is a public transit authority that serves metropolitan Portland, Oregon. This non-profit, municipal corporation was organized under state of Oregon statutes. Since its founding in 1969, TRI-MET has aggressively expanded and improved transit service to the Portland area with projects such as the downtown Portland Transit Mall, Fareless Square (a fare-free zone in downtown Portland), and suburban transit transfer stations. TRI-MET planned, implemented, operated, and monitored the SSFC demonstration. It developed and administered the evaluation surveys and collected operations data necessary for the evaluation.

Transportation Systems Center (TSC) is responsible to UMTA for the evaluation of the project and the management of the evaluation program. UMTA and TSC specified issues of national interest, while TSC provided guidelines for evaluation planning and methodology.

Peat Marwick was contracted by TSC to conduct the evaluation. Peat Marwick documented its findings in this report.

J.W. Leas & Associates, as part of this study, conducted an evaluation of SSFC equipment.



Before SSFC



During SSFC

FIGURE 1-1. TIME LINE OF DATA COLLECTION ACTIVITIES

2. SITE DESCRIPTION

The Portland Metropolitan Statistical Area (MSA) is located in the northwest corner of Oregon adjacent to southwest Washington at the confluence of the Willamette and Columbia Rivers. It comprises Clackamas, Multnomah, and Washington Counties in the State of Oregon and Clark County in the State of Washington (Figure 2-1). The MSA land area totals 3,650 square miles.

Portland is the central city and core area of the Portland MSA. It straddles the Willamette River for several miles south of the Willamette's junction with the Columbia. Most of the City of Portland is within the boundaries of Multnomah County; however, parts extend into Clackamas and Washington Counties.

In 1980, the Portland MSA's population was 1,242,594, and the City of Portland's population was 366,383. Together, Clackamas, Multnomah, and Washington Counties, which constitute the area served by TRI-MET, account for about 40 percent of total Oregon population.

Land use in the region is characterized by a high density downtown, a large port and industrial area, a stable urban residential area, and dispersed suburban and rural communities. Regional topography has strongly influenced land use in the MSA. The confluence of the Columbia and Willamette Rivers has helped make the area a major shipping and distribution center for a large part of the Pacific Northwest. Major concentrations of industrial development are located along the Oregon portion of both rivers. The West Hills between downtown Portland and the Tualatin Valley have fostered the development of a more autonomous suburban area in Washington County than has historically developed in suburban Clackamas or Multnomah Counties.

2.1 DEMOGRAPHY

In the past two decades, the Portland area grew tremendously. Between 1960 and 1970, Portland MSA population increased by 51.1 percent, and between 1970 and 1980 by 23.1 percent (Table 2-1). Between 1970 and 1980, Portland MSA population and employment growth rates for the Portland MSA were approximately twice those for the nation as a whole (Figure 2-2).

This growth, however, was not uniform throughout the region. The growth occurred mostly in the suburban Counties of Washington, Clackamas, and Clark. The population of the urban county of Multnomah, which includes most of the City of Portland, grew in the 1960s by only 7.6 percent and in the 1970s by only 1.1 percent. The City of Portland in the 1960s lost 1.7 percent of its population and in the 1970s lost 4.2 percent.

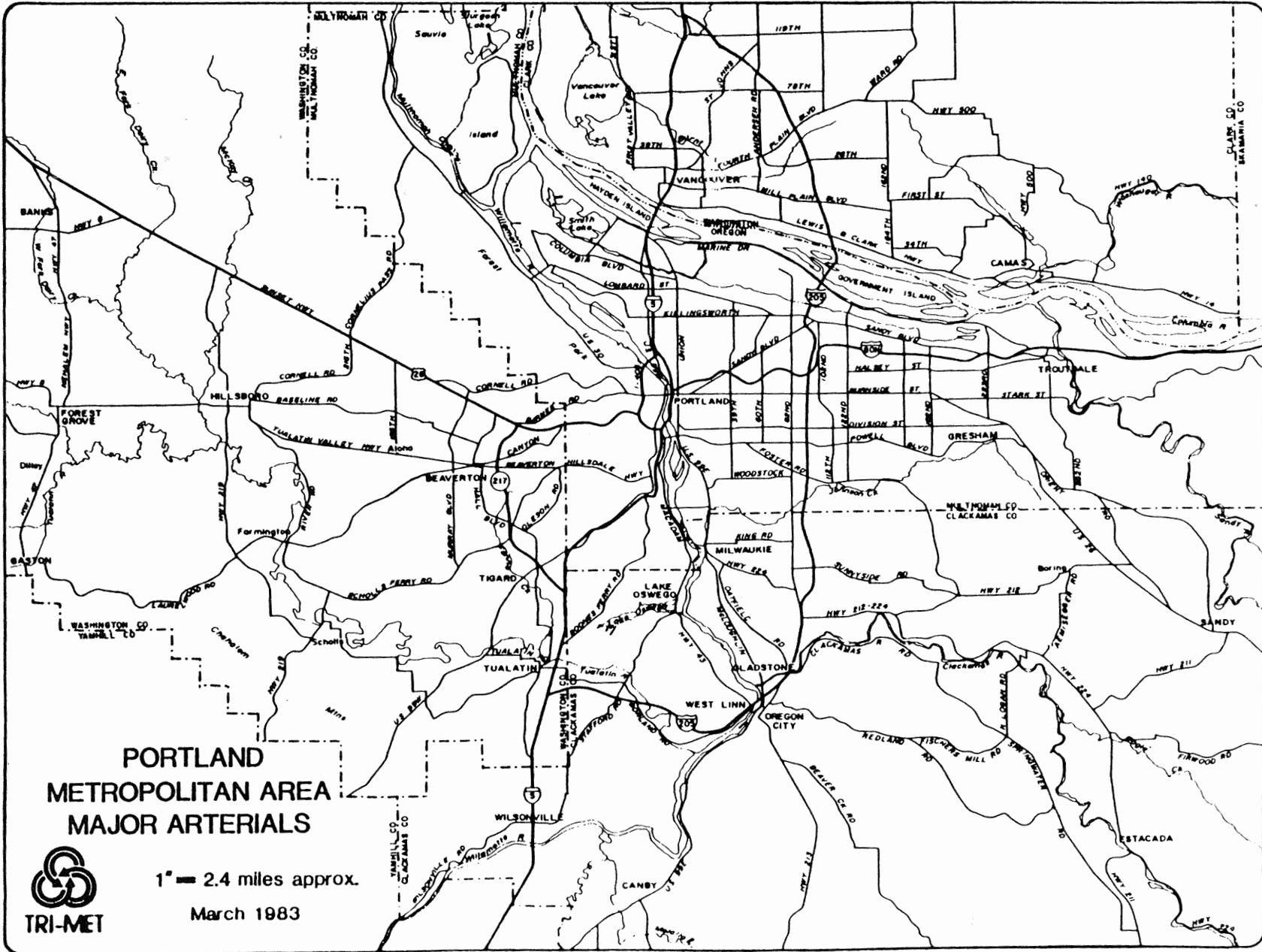


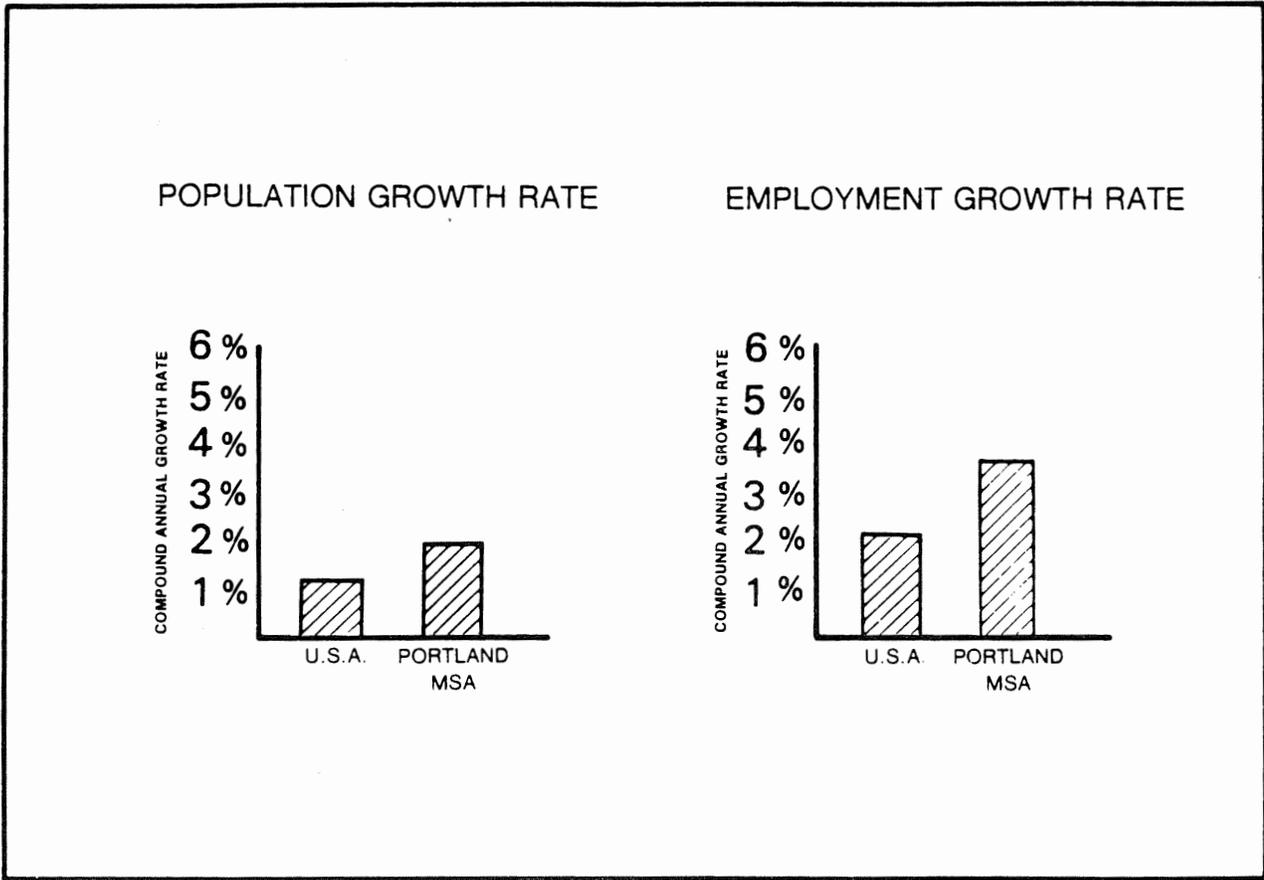
FIGURE 2-1. PORTLAND METROPOLITAN AREA

TABLE 2-1

POPULATION GROWTH AND DISTRIBUTION

<u>Area</u>	<u>1980 Population Total MSA</u>	<u>% Change 1960-1970</u>	<u>% Change 1970-1980</u>
Portland MSA	1,242,594	51.1%	23.1%
City of Portland	366,383	-1.7	-4.2
Multnomah County	562,640	7.6	1.1
Washington County	245,808	166.1	55.7
Clackamas County	241,919	114.0	45.7
Clark County	192,277	104.9	49.6

Source: U.S. Bureau of Census, 1980 Census of the Population.



Source: METRO, Preliminary Draft of the METRO Recommended Regional Transportation Plan, November 1981, p.24

FIGURE 2-2. COMPARISON OF NATIONAL AND PORTLAND MSA POPULATION AND EMPLOYMENT GROWTH RATES 1970-1980

Between 1970 and 1980, total civilian employment in the Portland MSA rose from 399,640 to 582,364, a 46 percent increase. Table 2-2 presents trends in per capita income and the Consumer Price Index (CPI) in the Portland MSA relative to comparable Oregon and national data. In 1979, per capita income of the Portland MSA was significantly higher than that of the United States as a whole (\$10,067 versus \$8,757). However, inflation was more severe in Portland than in the United States as a whole (CPI of 225.4 versus 217.4).

2.2 TRANSPORTATION AND TRAVEL PATTERNS

Private autos and trucks dominate the Portland MSA's regional transportation system. Figure 2-3 illustrates that, of total daily trips in 1977, 83.5 percent were by automobile, 7.9 percent by walking, and 3.6 percent by transit. Other modes accounted for 5.0 percent. For home-based work trips in 1977, 90.8 percent were by automobiles, 5.9 percent by transit, 1.9 percent by walking, and 1.4 percent by other modes.

Historically, metropolitan area travel was oriented primarily toward the downtown core and industrial areas along the Willamette River. Although most work trips are still to the city of Portland, Portland's share of the region's jobs, particularly industrial jobs, is decreasing. The rate of population and employment growth in the suburbs has exceeded that of the city of Portland. This increase has fostered growing suburban travel for both work and nonwork purposes.

Transportation in the Portland metropolitan area is currently experiencing deficiencies in both its highway and transit systems.* During peak hours, these deficiencies cause congestion and bottlenecks.

2.3 FUTURE GROWTH IN TRAVEL DEMAND**

At the time of SSFC planning, projections for year 2000 for the Oregon portion of the Portland MSA showed population increasing 36 percent and employment increasing 51 percent. These large projected increases would result in substantial

* TRI-MET, Five Year Transportation Development Plan FY 1981-1985, September 1980, p. III-1, III-2.

** All projections are from METRO, Preliminary Draft of the METRO Recommended Regional Transportation Plan, November 1981. This document covers year 1980 through year 2000.

TABLE 2-2

RELATIVE TRENDS IN PER CAPITA PERSONAL INCOME
AND CONSUMER PRICE INDEX

	<u>1970*</u>	<u>1975*</u>	<u>1979**</u>	<u>% Change</u> <u>1970-1975</u>	<u>% Change</u> <u>1975-1979</u>
United States					
Per Capita Income (\$)	\$3,893	5,861	8,757	51%	49%
Consumer Price Index	116.3	161.2	217.4	39	35
Oregon					
Per Capita Income (\$)	3,677	5,764	8,877	57	54
Consumer Price Index	NA	NA	NA	NA	NA
Portland MSA					
Per Capita Income (\$)	4,167	6,457	10,067	55	56
Consumer Price Index	113.2	156.5	225.4	38	44

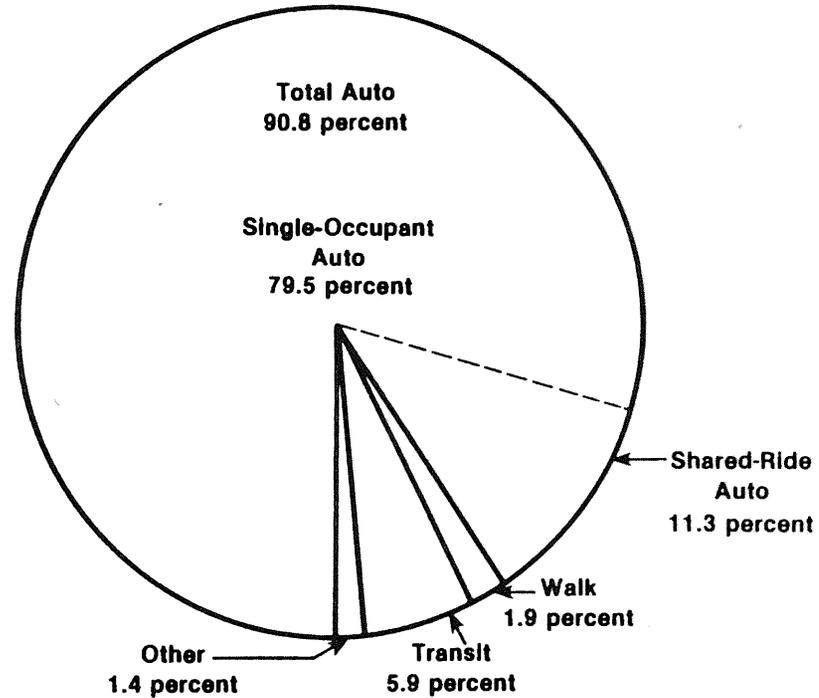
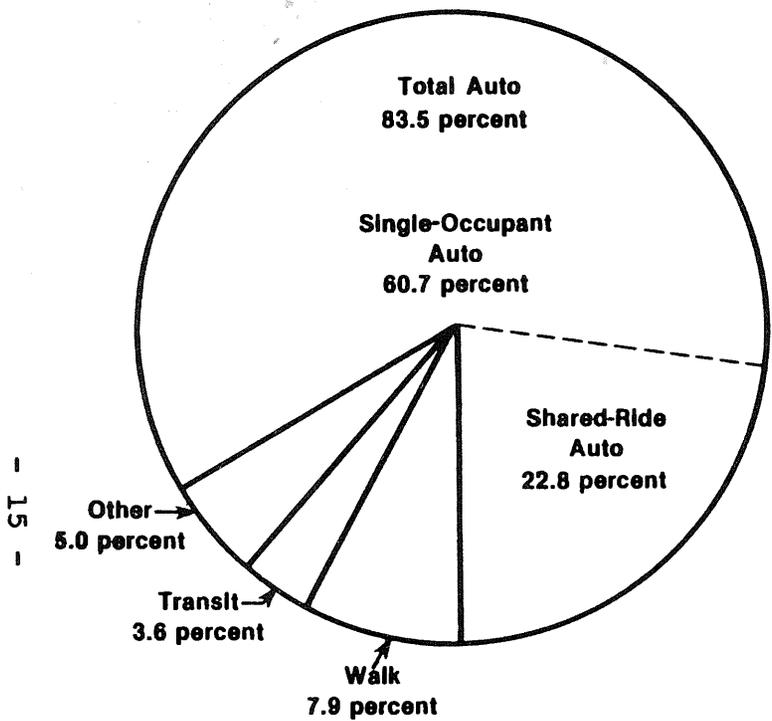
* Data for all urban wage earners and clerical workers.

** Data for all urban consumers.

Source: Data from Bureau of Economic Analysis, U.S. Department of Commerce (Preliminary, Subject to Revision) as cited in Annual Planning Information FY 82 For the Portland Area, State of Oregon Employment Division, May 1981.

TOTAL DAILY TRIPS

HOME-BASED WORK TRIPS



Source: METRO, Crag Travel Behavior Survey: Design Implementation, and General Results, Technical Memorandum No. 10, May 1978.

FIGURE 2-3. REGIONAL MODE SPLIT IN 1977

increases in travel. Table 2-3 illustrates that the total number of trips produced in the Oregon portion of the region would increase by almost 45 percent. Work trips were projected to grow faster than non-work trips, largely because employment growth was expected to exceed population growth. The growth in work trips would increase demand for additional capacity on highway and transit systems during peak travel periods.

Despite the trend toward suburbanization of employment opportunities and population, METRO projected that in the year 2000 about 72 percent of all regional trips would be within currently settled areas. Projected continued growth of downtown Portland employment for the year 2000, would increase trips to downtown by 26 percent.

2.4 TRI-MET TRANSIT SERVICE

TRI-MET, which is the mass transit authority for the Portland metropolitan area, is the largest transit district in Oregon and the fifth largest U.S. transit operator on the West Coast. It operates in three counties (Multnomah, Washington, and Clackamas) which cover an area of 3,066 square miles with a total population of about 1,050,000. Service is provided in 1,000 square miles of the district. Table 2-4 presents selected Fiscal 1980 operating statistics for TRI-MET at the time of the grant application for self-service fare collection (SSFC).

After it assumed ownership of the private transit companies, TRI-MET greatly expanded transit service to Portland. Between 1970 (when TRI-MET assumed operation of the last of the area's private transit companies) and 1980, TRI-MET replaced the original 293-bus fleet with 570 diesel buses and increased service miles by 400 percent. As a result, by 1980 ridership doubled to 145,000 average daily passengers, and TRI-MET's share of work trips to and from downtown Portland grew to 35 percent.

TRI-MET operates 24 hours a day, 7 days a week. During peak travel periods, most bus lines operate at 5- to 20-minute headways. Off-peak, bus lines generally operate at 15- to 60-minute headways. A few buses continue operating during the early morning hours to provide "owl service" on selected routes.

Like other U.S. bus systems, TRI-MET used drivers to enforce and inspect fare collection. However, Fareless Square required changes to the standard pay-as-you-enter system. On crosstown and inbound routes, patrons filed past the driver and paid as they entered. On outbound routes from downtown Portland, patrons exited past the driver and paid as they left the bus except during afternoon peak hours when Fareless Square was suspended.

TABLE 2-3

TOTAL DAILY VEHICULAR PERSON TRIPS BY PURPOSE
(Oregon Productions)
1980-2000

	1980	% Total	2000	Net Change	% Change
<u>Work Trips</u>	718,000	20.8	1,095,000	+377,000	+52.5
<u>Non-Work Trips</u>	2,416,000	69.9	3,405,000	+989,000	+40.9
Home-Based	1,403,000	40.6	1,937,500	+534,500	+38.1
Non-Home-Based	1,013,000	29.3	1,467,500	+454,500	+44.9
<u>Commercial Trips</u>	176,000	5.1	262,000	+ 86,000	+48.9
<u>External Trips</u>	146,000	4.2	238,000	92,000	+63.0
<u>Total</u>	3,456,000	100.00	5,000,000	1,544,000	+44.7

Source: METRO, Preliminary Draft of the METRO Recommended Regional Transportation Plan, November 1981.

TABLE 2-4

TRI-MET FISCAL 1980 OPERATING STATISTICS
(July 1, 1979-June 30, 1980)

Service Area

Population	1,050,367
Total District Size	3,066 sq. miles
Service Area Size	1,000 sq. miles

Employees

Bus Operators	1,000
Maintenance Employees	180
Other Operations Personnel	130
Administrative Personnel	190

Operations

Standard Diesel Buses	570
Bus Routes	71
Route Miles	1,956
Weekday Bus Miles	73,966
Annual Bus Miles	21,649,138
Average Weekday Passengers	145,900
Annual Passengers	43,953,000

Facilities

Downtown Transit Mall	22 blocks
Transit Stations	3
Park and Ride Lots	68
Parking Spaces	3,600
Bus Garages	3
Bus Stop Shelters	700
Bus Stops	8,000

3. DEMONSTRATION HISTORY

This section discusses events leading to TRI-MET's grant application for a self-service fare collection (SSFC) demonstration, changes to demonstration schedule, planning for demonstration, changes in service, implementation of SSFC, and changes after the demonstration.

Figure 3-1 presents a time line of major SSFC demonstration events.

3.1 EVENTS LEADING TO GRANT APPLICATION

In 1979, TRI-MET introduced its 5-year transit development program. Two of the program's goals were to:

- . expand transit service to meet projected increases in ridership; and
- . improve the productivity of transit operations.

To meet these goals, 2 plans of the 5-year development program called for purchasing 125 articulated buses and constructing a 15-mile light rail line on the east side of Portland. This rail line would run from downtown Portland to downtown Gresham. TRI-MET expected articulated buses to improve productivity by providing, for the same operator costs, 40 percent more capacity than that provided by standard buses. It expected the light rail line to improve productivity because operating costs would be less than those of comparable bus service.

TRI-MET, to keep costs down, wanted single person operation of articulated buses and light rail vehicles. It expected that with traditional fare collection, single person operation of multi-door vehicles would not be productive because access would be limited to one door. In response, TRI-MET studied alternative fare collection methodologies.

Other factors contributing to the study were:

- . The desire for a distance-based fare structure. Concern had been expressed at public hearings that the base fare was too high and that it was subsidizing long distance trips. At that time, TRI-MET had a 3-zone fare system and believed that the existing fare collection system could not operate with more zones.

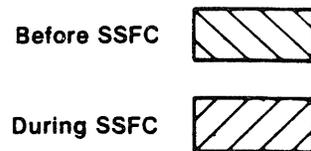
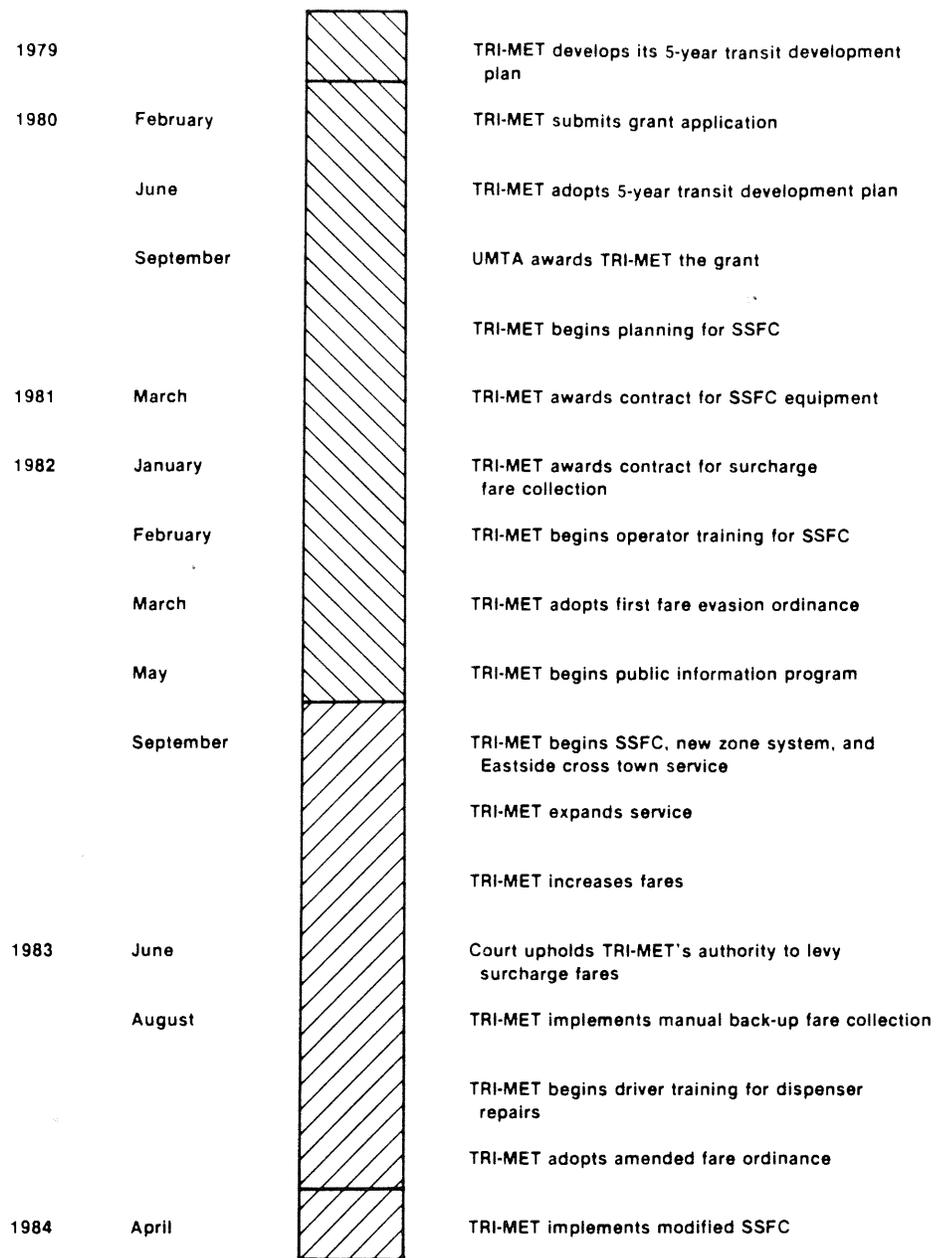


FIGURE 3-1. TIME LINE OF SSFC EVENTS

- . The realization that fare boxes would eventually need to be replaced. TRI-MET's existing fare boxes could not accommodate the increase in the use of dollar bills that would accompany future fare increases.
- . The desire to reduce fare evasion. TRI-MET's 1979 fare evasion study concluded that fare boxes were often shortchanged and zone fares were often avoided.

The study recommended that SSFC could best address these concerns. Therefore, TRI-MET applied to the Urban Mass Transportation Administration (UMTA) for a demonstration grant to implement SSFC.

At about the same time, UMTA concluded that SSFC might have significant benefits for U.S. transit systems. UMTA's interest was sparked by the success of SSFC in Europe and plans by the Metropolitan Transit Development Board in San Diego to implement SSFC on its new light rail line. In September 1980, UMTA awarded Service and Methods Demonstration (SMD) and capital assistance grants to help fund SSFC implementation on TRI-MET's bus system.

3.2 CHANGES TO DEMONSTRATION SCHEDULE

TRI-MET originally planned to conduct the demonstration in three phases:

- . Planning would include equipment procurement, training, and marketing for implementation of SSFC. Legal issues would be examined, and appropriate changes in state and local legislation would be effected.
- . Limited SSFC would include using SSFC equipment in each vehicle to collect fares with driver supervision of fare payment; fare inspectors would not be used to monitor and enforce fare collection. Passengers would enter through front doors and be required to have proof of payment. During this phase it would be possible to revert quickly to conventional fare collection should it be required by adverse political, legal, or technical considerations.
- . Full-Scale SSFC would feature full access and egress through all doors and reliance on frequent random checks by inspectors in lieu of driver supervision of fare payment.

During implementation planning, concern was expressed that even though phased implementation was cautious and flexible, it would not yield expected benefits immediately and would create the impression that the fare system was constantly changing. Therefore TRI-MET decided to proceed with full, rather than phased, implementation. The increased simplicity of a single systemwide switch and the immediate realization of expected operating benefits outweighed the benefits of the more cautious multi-phase approach. Although equipment requirements for limited and full-scale SSFC were the same, the decision to go with full implementation required additional expenditures for fare inspectors.

3.3 PLANNING FOR THE DEMONSTRATION

TRI-MET began demonstration planning in 1980. During that time TRI-MET:

- . developed and implemented a public and employee information program;
- . researched and developed a fare evasion ordinance;
- . procured and tested SSFC equipment;
- . developed new prepayment options;
- . designed a new zone system;
- . developed a surcharge fare billing and collection system; and
- . developed an evaluation program.

To coordinate and manage these tasks, TRI-MET established a project control committee. The committee was charged with overseeing the demonstration and with making recommendations on technical issues. The committee assigned nine subcommittees to perform the tasks and prepare technical recommendations:

- . fare structure and policy;
- . ticket, pass, and schedule sales and distribution;
- . SSFC equipment;
- . legal issues;
- . fare inspection;
- . records, billing, and collection;

- . SSFC operations;
- . public information; and
- . evaluation.

This organizational structure aided coordination between the departments within TRI-MET and assigned responsibility for specific tasks to groups of appropriate persons.

3.4 CHANGES IN SERVICE

Coincident with its decision to implement full-scale SSFC, TRI-MET decided to implement several service changes at the same time:

- . zone structure changes;
- . fare changes;
- . ticket and pass changes; and
- . City and Eastside Transit Improvement Program (CETIP).

TRI-MET made the changes all at once to maximize marketing dollars spent, to minimize confusing the public, and to limit the number of training programs needed for the public and employees.

3.4.1 Zone Structure Changes

Before SSFC, TRI-MET had three zones. SSFC enabled TRI-MET to expand its zone system from three to five zones, as shown in Figure 3-2. The five-zone system allowed more equitable distance-based fares.

Under the old zone structure, zone 1 comprised Fareless Square, zone 2 comprised the city of Portland and zone 3 comprised the suburbs. With the SSFC zone structure, TRI-MET enlarged zone 1 to create an "inspection band" around Fareless Square and spaced the other zone boundaries between three and five miles apart. TRI-MET designed the zones to be approximately equal in width. However, the suburban zones are wider than the inner city zones so that suburban centers can lie within one zone.

When planning the SSFC zone structure, TRI-MET studied implementing a cellular system or a circumferential system. Cellular systems, which are used by some European transit systems, have zones that are approximately equal in size. Such

FARES BEFORE SSFC

	CASH OR TICKET	MONTHLY PASS
Vancouver - Portland	\$1.00	\$35.00
Adult 3-Zone	.90	29.00
Adult 2-Zone	.65	21.00
Youth All-Zones	.45	14.00
Retarded Citizen (all hours; all zones)	.25	None
Honored Citizen Same as "Adult" fare (weekdays 7-9 am, 4-6 pm)		
Honored Citizen (all other hours, all zones)	.25	None

RETARDED CITIZENS must obtain a STAR card from Clackamas, Multnomah or Washington County Association for Retarded Citizens.
HONORED CITIZENS must have proof of payment of adult fare with them during peak hours. The Honored Citizen Monthly Pass will count 25¢ toward the full adult fare. 10-Ride Tickets for Honored Citizens are available for regular adult fares. Books of 25¢ tickets are still available for Honored Citizens.

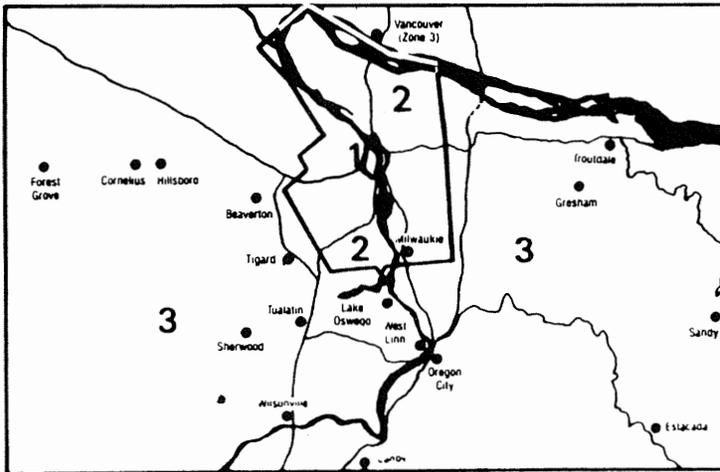
FARES DURING SSFC

	CASH	10-RIDE TICKET	VALID AS TRANSFER	MONTHLY PASS
Adult All-Zones	\$1.25	\$11.50	2½ hours	\$40.00
Adult 3-Zone	1.00	9.00	2 hours	32.00
Adult 2-Zone (1 or 2 zones)	.75	6.50	1½ hours	23.00
Short Hopper				
1-Zone	None	5.00	1 hour	None
24-Hour All-Zones (unlimited rides)	None	2.50	24 hours	None
Youth All-Zones	.50	4.50	2½ hours	15.00
Retarded Citizen (all hours; all zones)	.25	None	2½ hours	6.00
Honored Citizen Same as "Adult" fare (weekdays 7-9 am, 4-6 pm)				
Honored Citizen (all other hours; all zones)	.25	None	2½ hours	6.00

2-ZONE 10-RIDE TICKET plus 25¢ will permit travel within three zones, or the same ticket plus 50¢ will permit travel anywhere. **3-Zone 10-Ride Ticket** plus 25¢ will permit travel anywhere.
2-ZONE MONTHLY PASS holders may travel within three zones upon payment of an additional 25¢, or may travel anywhere within the system upon payment of an additional 50¢. **3-Zone Monthly Pass** holders may travel anywhere on any regularly scheduled route upon payment of 25¢.
RETARDED CITIZENS must obtain a STAR card from Clackamas, Multnomah or Washington County Association for Retarded Citizens.
HONORED CITIZENS must have proof of payment of adult fare with them during peak hours. The Honored Citizen Monthly Pass will count 25¢ toward the full adult fare. 10-Ride Tickets for Honored Citizens are available for regular adult fares. Books of 25¢ tickets are still available for Honored Citizens.

- 24 -

ZONE STRUCTURE BEFORE SSFC



ZONE STRUCTURE DURING SSFC

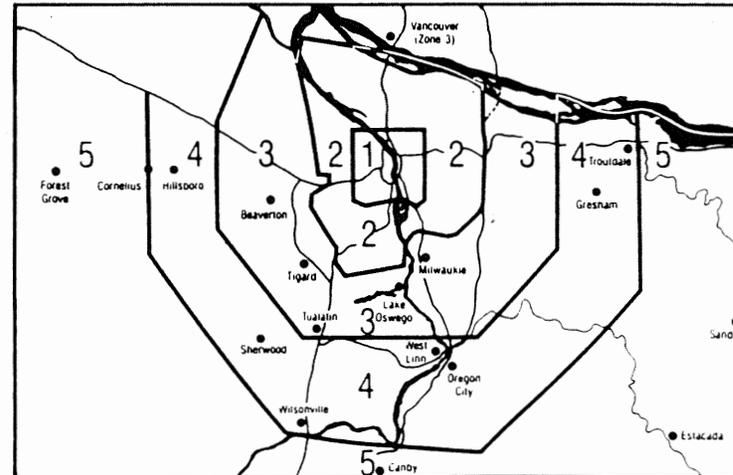


FIGURE 3-2. CHANGES IN FARES AND ZONE STRUCTURE

systems are appropriate for large cities with widely scattered activity centers. Circumferential systems have concentric zone boundaries around a single major activity center. Such systems are appropriate for predominately radial systems. TRI-MET chose a circumferential system because (1) it was simpler, (2) it would generate almost as much revenue as would the cellular system, and (3) it would encourage use of its new crosstown service.

3.4.2 Fare Changes

Before the implementation of SSFC, TRI-MET had a 3-zone, variable fare structure:

- . Under TRI-MET's 3-zone structure, base fare covered travel between any 2 zones, and TRI-MET levied a zone charge for 3-zone trips. Zone 1, covering downtown Portland, was a fare-free zone called Fareless Square.
- . TRI-MET's variable fare structure discounted fares to students, children, and senior (honored) citizens. Monthly passes provided discounts to commuters and frequent users. In Fiscal 1981, monthly passes accounted for nearly 46 percent of total fare collections.

With SSFC implementation, TRI-MET lowered adult fares for the shortest trips by 23 percent, and raised adult fares between 15 and 39 percent, depending on the distance traveled. Figure 3-2 presents the fares from before and during SSFC.

When developing the new fares, TRI-MET had to decide how many zones the base fare would cover and how many zones would require additional charges. TRI-MET decisions on the new fares included:

- . The base cash fare covered two zones so that persons living near zone boundaries would not be penalized.
- . A 1-zone discount fare was instituted to encourage short 1-zone trips. This fare could only be paid using a 10-ride ticket.
- . The fare structure had 4 zone fares (1-zone, 2-zone, 3-zone, and all zones) instead of 5 because fewer than 2 percent of its riders rode 5 zones.

3.4.3 Ticket and Pass Changes

TRI-MET made several changes to its tickets and passes to enable SSFC to expand use of prepaid fares. TRI-MET:

- . replaced prepaid single-ride tickets with 10-ride tickets;
- . added 2 new categories of tickets, a "short hopper" 10-ride 1-zone ticket, and a 24-hour all-zone ticket;
- . added monthly passes for mentally handicapped and elderly riders; and
- . discounted adult 10-ride tickets between 8 and 33 percent and adult monthly passes between 20 and 23 percent.

SSFC required that tickets and passes display boarding information so that fare inspectors could determine their validity. Single-ride tickets issued to cash passengers and validated 10-ride and 24-hour tickets displayed boarding zone, time, date, number of valid zones, and fare category. Tickets were valid for one to 24 hours, depending on the ticket (Figure 3-2). Passes displayed origin and destination zones, fare category, and valid month. Figure 3-3 presents examples of TRI-MET's SSFC tickets and passes. The use of tickets with time information obviated the need for transfers.

3.4.4 CETIP

CETIP called for initiating crosstown bus service on Portland's east side and for increasing daily service by 400 bus hours (an 8 percent increase). Before CETIP implementation, TRI-MET had a radial route structure with almost all routes serving downtown Portland.

3.5 IMPLEMENTATION OF SSFC

TRI-MET implemented SSFC on Sunday, September 5, 1982, of Labor Day weekend. Light traffic gave TRI-MET a two-day shakedown period. The switch to SSFC occurred without any major problems; operations during the first rush hour went smoothly.

Three major factors affected the demonstration:

- . SSFC equipment breakdowns were frequent, especially with the dispensers and validators. Frequent breakdowns caused service delays, reduced service reliability, increased maintenance costs, and resulted in lost revenues. (When dispensers

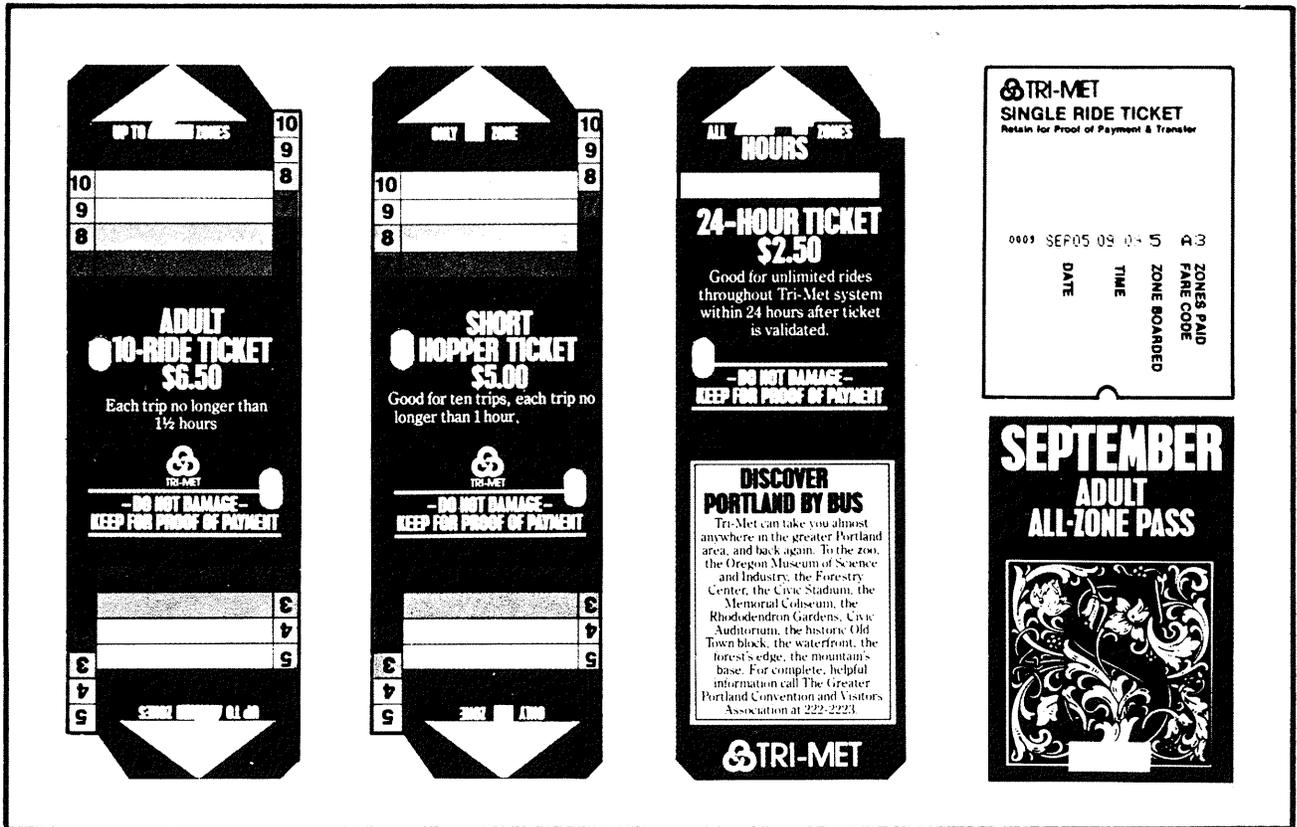


FIGURE 3-3. SSFC TICKETS AND PASSES

malfunctioned, passengers rode free until eleven months into the demonstration when TRI-MET implemented a manual back-up dispenser system.)

- . Fare evasion revenue losses during SSFC were much higher than they were before SSFC.
- . The 1982 recession reduced TRI-MET's receipts from its payroll tax and the fare box during the demonstration. When compared with 1981 figures, average annual employment in the Oregon portion of the MSA was 2.3 percent lower in 1982, and 1.7 percent lower in 1983 (Figure 3-4). Ridership lagged behind employment trends. When compared with 1981 average annual ridership increased .8 percent in 1982 but declined 1.1 percent in 1983. Declines in revenues from fares and the payroll tax accentuated revenue losses from fare evasion.

After SSFC began, TRI-MET dismantled the project control committee which oversaw demonstration planning and dispersed SSFC management responsibilities among its operating departments. During the demonstration when TRI-MET realized that equipment performance would not improve without major investments and that revenue losses could not be reduced, it established a fare policy committee to study fare collection options after demonstration funding expired. The committee comprised members who were responsible for SSFC functions in the various operating departments. The committee recommended that TRI-MET implement a limited SSFC system.

3.6 CHANGES AFTER THE DEMONSTRATION

In April 1984, TRI-MET instituted a limited SSFC system by which all-door boarding occurred only in Fareless Square from 6:30 a.m. to 6:30 p.m. weekdays. All others were driver-monitored, front-door boardings. TRI-MET used 6 fare inspectors to monitor outbound trips from Fareless Square. It discontinued use of SSFC equipment, reinstated use of transfers, replaced 10-ride tickets with booklets of 10 tickets, and continued use of the 5-zone fare structure. Passengers paying with cash or with tickets received one of two transfers--a blue one which was good for up to two zones or a white one which was good for three or more zones. Drivers punched the type of fare on the transfer.

Fare evasion with partial SSFC was higher than that of traditional fare collection. Despite the higher revenue losses, TRI-MET used SSFC in Fareless Square in order to:

- . maintain the option of having some form of SSFC on buses when it opens its light rail line. TRI-MET

Average Annual Employment for the Oregon Portion of The Portland MSA (In Thousands)

TRI-MET Annual Ridership (In Millions)

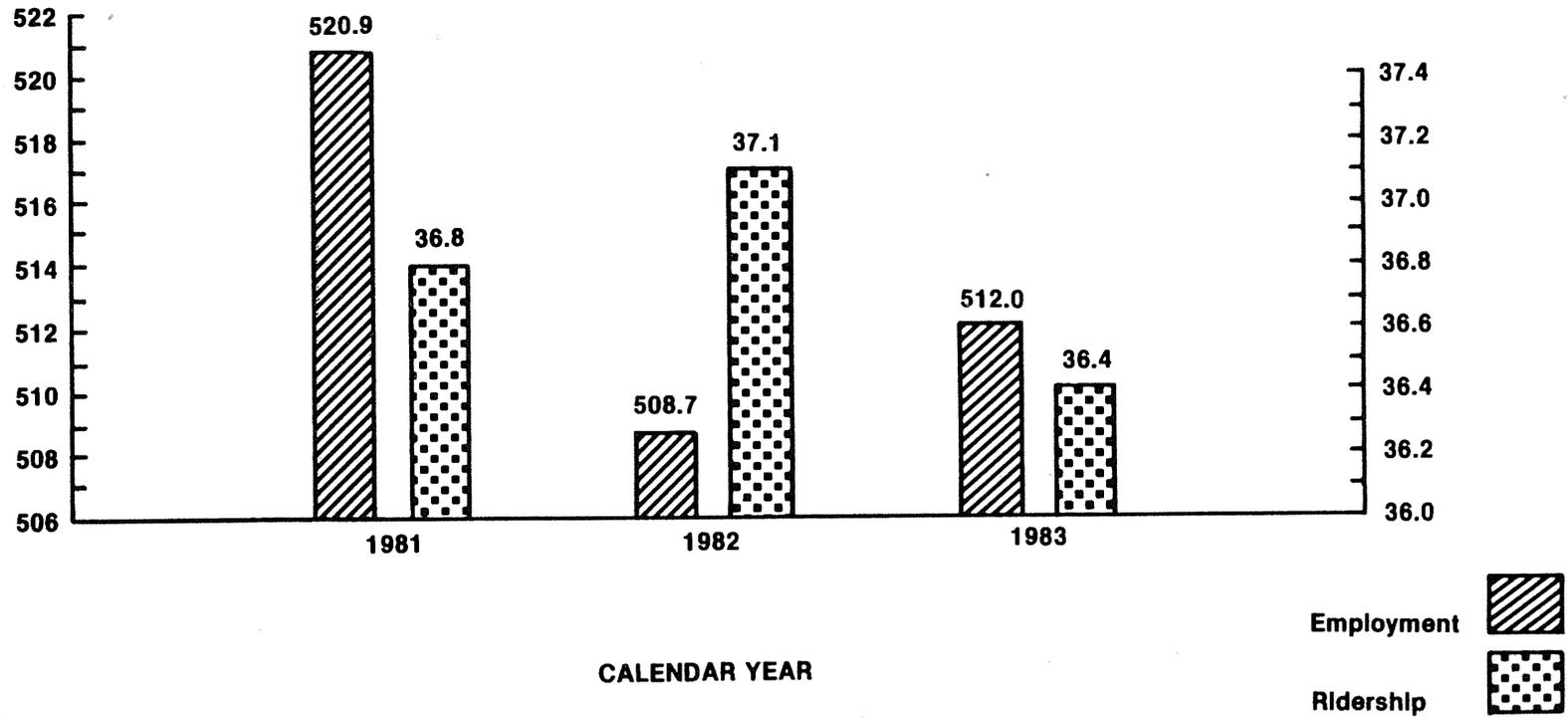


FIGURE 3-4. ANNUAL EMPLOYMENT AND RIDERSHIP DURING THE DEMONSTRATION

planned to use SSFC on its light rail and believed that, if SSFC was cancelled, it could not reinstitute it in any form on buses.

- . have all-doors boarding on articulated buses in Fareless Square (one of the reasons why TRI-MET implemented SSFC).
- . avoid the confusion of having different payment procedures for peak and off-peak periods. Before SSFC, TRI-MET had different payment procedures for peak and off-peak outbound trips from Fareless Square. TRI-MET believed the different procedures confused riders.

In anticipation of the opening of the light rail line, TRI-MET is reviewing fare policy. After the review is completed TRI-MET will decide whether to keep SSFC in Fareless Square.

4. SELF-SERVICE FARE COLLECTION EQUIPMENT

Fare structure and payment changes (increasing the number of fare zones, introducing 10-ride tickets, eliminating transfer slips, and requiring proof of payment) and bus boarding changes defined self-service fare collection equipment needs.

This section discusses TRI-MET's SSFC equipment:

- . operation;
- . capital and installation costs;
- . procurement;
- . testing;
- . performance;
- . reviews; and
- . maintenance.

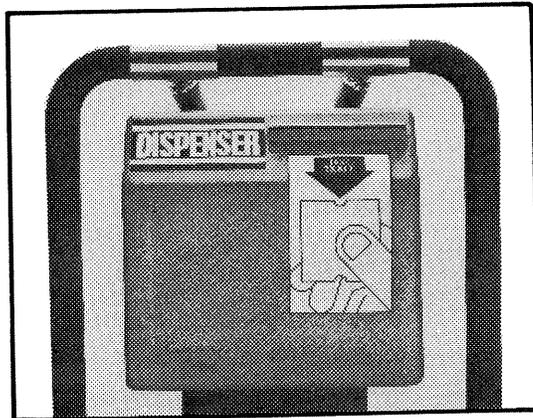
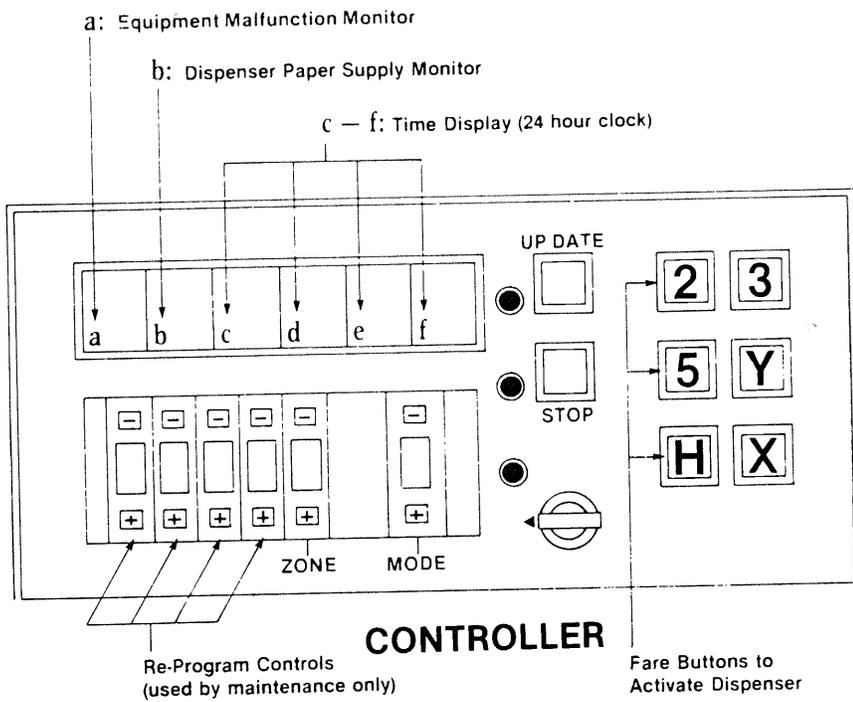
4.1 OPERATION

TRI-MET's on-board fare equipment consisted of validators, ticket dispensers, and control units (controllers). This equipment accommodated 10-ride and 24-hour tickets, and cash fares. Figure 4-1 displays schematics of these components. TRI-MET modified rear-door controls to allow driver-operated rear doors on standard buses and driver- and passenger-operated rear doors on articulated buses.

4.1.1 Controller

Located on the dash in front of the bus, the driver-activated controller regulated the validators and the dispenser. The controller contained a clock, controls for setting zones and fare categories, and a system malfunction indicator light. The controller tallied ticket dispensing and validating activity, and displayed time and zone information for the driver. When a bus crossed a zone line, the driver manually set the controller for the proper zone. When a passenger paid cash, the driver depressed the appropriate controller key for the type of fare, activating the dispenser which issued a ticket.

If the validator or dispenser malfunctioned, a warning light flashed on the controller indicating which unit was malfunctioning. It did not, however, provide information on the nature of the malfunction.



- VALIDATOR LOCATIONS ON BUS
- DISPENSER LOCATIONS ON BUS

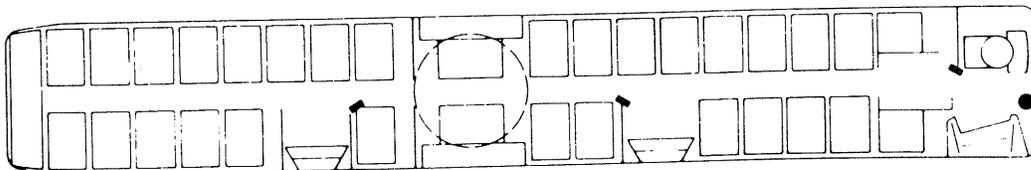
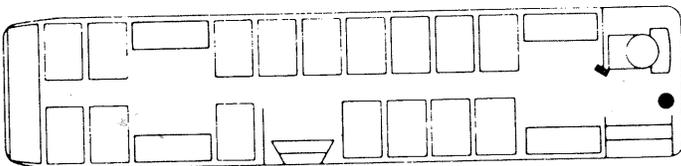


FIGURE 4-1. TRI-MET SELF-SERVICE FARE COLLECTION EQUIPMENT

4.1.2 Dispensers

TRI-MET retained existing fare boxes for passengers paying cash, and installed a new piece of equipment nearby--a ticket dispenser. The dispenser, a driver-activated machine, issued single-ride tickets for fares deposited in the fare box. The dispenser printed the machine number, boarding zone, time, date, number of valid zones, and fare category. The electronic and software components of the dispenser were similar to those of the validator.

4.1.3 Validators

When a passenger inserted a ticket in the validator, the validator clipped a corner from the ticket and printed the boarding date, time, and zone. The validators accommodated TRI-MET's 10-ride and 24-hour tickets. For 10-ride tickets, the validator clipped the corner and printed on the line corresponding to the trip number (Figure 3-3 in Section 3). In Portland, one validator was located directly behind the driver's seat in standard buses, and in articulated buses, additional validators were located inside both rear doors (Figure 4-1).

4.1.4 Rear-Door Controls

TRI-MET retrofitted its standard buses for rear-door boarding. Electrical and air system modifications allowed drivers to operate rear doors when operating front doors.

TRI-MET purchased articulated buses already equipped with driver- and passenger-operated rear doors. TRI-MET ordered this option to reduce rear-door opening in inclement weather. Passengers pressed buttons located on the interior and exterior of the buses to open the rear doors.

4.2 CAPITAL AND INSTALLATION COSTS

SSFC equipment capital costs totaled \$2,727,500; installation costs totaled \$503,400. Table 4-1 presents a breakdown of this data.

TRI-MET calculated installation costs by multiplying the average installation time by average mechanic hourly rates. SSFC equipment installation time averaged four hours a standard bus and eight hours an articulated bus. Rear-door retrofittings averaged three hours a standard bus. TRI-MET installed the SSFC equipment during August 1982 and retrofitted rear doors during the summer of 1982.

TABLE 4-1

SSFC EQUIPMENT CAPITAL
AND INSTALLATION COSTS

<u>SSFC Equipment</u>	<u>Unit Price</u>	<u>Unit Number</u>	<u>Capital Costs</u>	<u>Installation Costs</u>
Fare Collection Equipment	-	-	-	\$483,900
Controllers	\$417	874	\$353,200	-
Ticket Dispensers	1,008	904	911,200	-
Validators	945	1,198	1,132,100	-
Installation Hardware	-	-	81,000	
Rear-Door Boarding Equipment	502	498	<u>250,000</u>	<u>19,500</u>
TOTAL	-	-	<u>\$2,727,500</u>	<u>\$503,400</u>

4.3 PROCUREMENT

In 1979, TRI-MET, with help from a consultant, conducted a comprehensive study of SSFC bus equipment in Europe. The study was an outgrowth of TRI-MET's light rail planning work. On the basis of the study, TRI-MET decided that 3-component SSFC equipment would best meet its needs. TRI-MET therefore included funds for controllers, validators, and dispensers in its grant application to UMTA.

After the grant was awarded, TRI-MET and a consultant drafted specifications for the equipment and put the contract out for bid. The contract contained the following measures to ensure the equipment performed well:

- . required that the equipment meet stated performance standards. These standards were 10,000 hours of service between shop repairs for controllers, 30,000 uses between shop repairs for dispensers, and 50,000 uses between shop failures for validators.
- . provided for an open-ended testing program to be developed by the contractor and approved by TRI-MET.
- . tied equipment acceptance and payment to meeting the required performance standards.

TRI-MET awarded the contract to the low bidder, a joint venture of CAMP, a French firm, and Vultron, Inc., of Michigan. CAMP is a leading manufacturer of SSFC equipment in Europe with an excellent reputation.

TRI-MET planned to procure SSFC equipment that was already in revenue service and therefore had proven itself. However, dispensers were not used in Europe and the controllers and the validators that TRI-MET ordered (1) were the latest in CAMP's line of equipment that CAMP had tested but had not been used in revenue service and (2) went through extensive modifications to operate on American buses and to meet TRI-MET's needs.

Because cash fare collection practices in Europe are different from those in the United States, dispensers are not used in Europe. Therefore TRI-MET needed to procure a new design. TRI-MET contracted CAMP to design and manufacture a dispenser to be used with its controllers and validators. CAMP used many of the electronic components of the validator in its dispenser design to minimize the risks associated with designing wholly new equipment. The validators were modified to accept 10-ride tickets and all components of the validator and dispensers requiring 24 volts used by European buses were modified to run on 12 volts used by most American buses.

4.4 TESTING

In July 1981, TRI-MET received the first two prototype validators and a mechanical mock-up of the dispenser. The validators failed after an hour of use, could not be repaired, and were therefore returned to CAMP. The mock-up of the dispenser could not be mounted on TRI-MET buses and was designed to issue tickets from a bottom slot instead of at the top where TRI-MET wanted it. The unit was sent back for redesign.

In December 1981, TRI-MET received 10 pre-production validators and in February 1982, 10 pre-production dispensers for pre-approval tests. The equipment was not reliable enough to allow the conduct of the tests. In response, TRI-MET delayed the planned SSFC start-up date from June 20, 1982, to September 5, 1982.

After several weeks of poor reliability and numerous modifications by Vultron, equipment reliability improved to the point where pre-approval tests could be conducted. TRI-MET, expanding its test effort, contracted consultants to conduct extensive environmental and functional tests at Vultron's factory in Michigan. Environmental tests comprised temperature and mechanical shock tests; functional tests comprised cycling, performance verification, and voltage variation tests. The consultants and Vultron used ten sets of equipment, half on stands and half on buses.

Test results showed that:

- . The equipment generally worked but was not reliable.
- . Humidity adversely affected equipment performance.

Again, TRI-MET expanded testing. From April to August 1982, TRI-MET conducted simulated service tests on 50 buses. TRI-MET checked equipment performance each night. Continued reliability problems caused TRI-MET and Vultron to set up a van maintenance program for repairing in-service SSFC equipment.

Despite continuing serious performance problems with SSFC equipment, TRI-MET decided to implement SSFC on September 5, 1982. The reasons for proceeding were:

- . marketing and public information efforts that had generated considerable expectations and momentum for commencing SSFC on September 5, 1982;
- . concern that the adoption of a more sophisticated fare and zone structure, planned for September 5, would slow schedules in the absence of SSFC;

- . belief that the full benefits of introducing articulated buses on high travel demand routes would not be realized without rear-door boarding, made possible by SSFC; and
- . perceived need to reduce the handling of cash fares, particularly dollar bills, likely to accompany the new fare structure.

TRI-MET, believing that SSFC equipment problems would continue to diminish over time, adhered to the planned schedule.

4.5 PERFORMANCE

The SSFC equipment proved unreliable. Table 4-2 presents the SSFC equipment mean time and uses between failures and shop repairs from September 1982 through August 1983, as compared with levels specified in the contract. As shown in the table, performance was way below contract specifications.

The performance levels specified in the contract were higher than achievable. J.W. Leas & Associates, Inc., who conducted an audit of TRI-MET's SSFC equipment, estimated that levels approximately 25 percent of the specified numbers were achievable. Actual performance was way below even this lower standard. Using TRI-MET's estimates of mean uses or time between shop repairs, controller performance was 64 percent of the lower standard, and dispenser performance and validator performance were 28 percent and 12 percent, respectively, of the lower standard.

Actual performance was poorer than TRI-MET's estimates. TRI-MET calculated the figures using aggregate data instead of disaggregate data. The use of aggregate data inflated the estimate. As part of its audit of TRI-MET's SSFC equipment, J.W. Leas & Associates, Inc., calculated the dispenser and validator performance figures by selecting 100 dispensers and 100 validators at random and reviewing their shop repair records from September 1982 through August 1983. J.W. Leas & Associates could not calculate a performance record for controllers because TRI-MET did not record controller time during repairs. As shown in Table 4-2, actual dispenser performance was 8 percent lower than TRI-MET's estimates and validator performance was almost half that estimated by TRI-MET.

CAMP/Vultron made three basic hardware modifications, one major software change, and many minor software changes to the SSFC equipment. The modifications failed to improve performance appreciably.

TABLE 4-2

SSFC EQUIPMENT MEAN PERFORMANCE*
(September 1982 - August 1983)

<u>Unit</u>	<u>Mean Uses or Time Between Failures</u>	<u>Mean Uses or Time Between Shop Repairs**</u>	<u>Audited Mean Uses or Time Between Shop Repairs***</u>	<u>Specified Performance Between Shop Repairs</u>
Controller	344 hrs	1,598 hrs	--	10,000 hrs
Dispenser	462 uses	2,079 uses	1,910 uses	30,000 uses
Validator	609 uses	1,558 uses	833 uses	50,000 uses

* Less low paper, no trouble found.

** TRI-MET estimates.

*** J.W. Leas & Associates estimates.

Figure 4-2 charts equipment performance between failures (running out of paper and findings of no trouble were not considered failures). The figure shows that controller and dispenser performance between failures declined during the demonstration. Validator performance between failures slightly improved.

Figure 4-3 presents the equipment performance between failures requiring shop repairs (running out of paper and findings of no trouble were not considered failures). The figure shows that performance of all equipment fluctuated. The performance of dispensers between shop repairs improved slightly while that of controllers did not improve and that of validators declined.

Some of the fluctuations in equipment performance were caused by the erratic reliability of the equipment. Other fluctuations were caused by equipment modifications and shortages of spare parts. For example, the low dispenser and validator performance in June 1983 was caused by equipment modifications and adjustments made that month. In August, validator performance data was affected by a shortage of spare parts. The shortage of spare parts forced TRI-MET to keep inoperable validators on buses, thus, falsely decreasing the number of failures that month.

As indicated by the performance data, failures were frequent and required a large maintenance and support effort. Table 4-3 presents the average monthly and daily failures for the SSFC equipment. The dispensers were the least reliable, accounting for 69 percent of all failures.

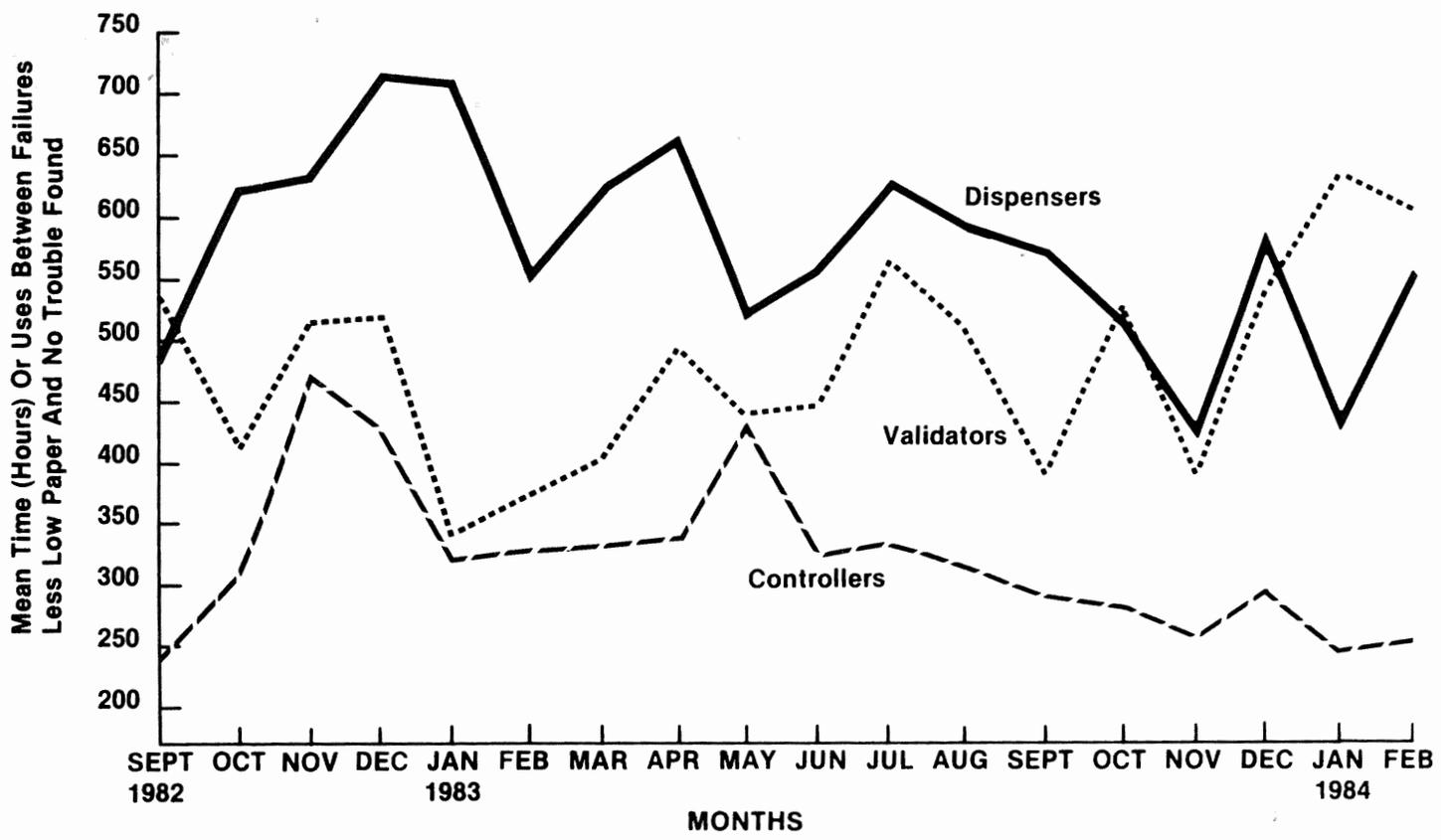
The following subsections discuss the most common failures for each unit. Table 4-4 presents a glossary of failure types.

4.5.1 Controllers

Wrong time or date (a defective clock) accounted for 45 percent of all controller problems (Figure 4-4). Such problems, considered solvable, were attributed to back-up battery failures, software imperfections, transient electrical interference, and erratic performance of the "chip" that produced the time signals.

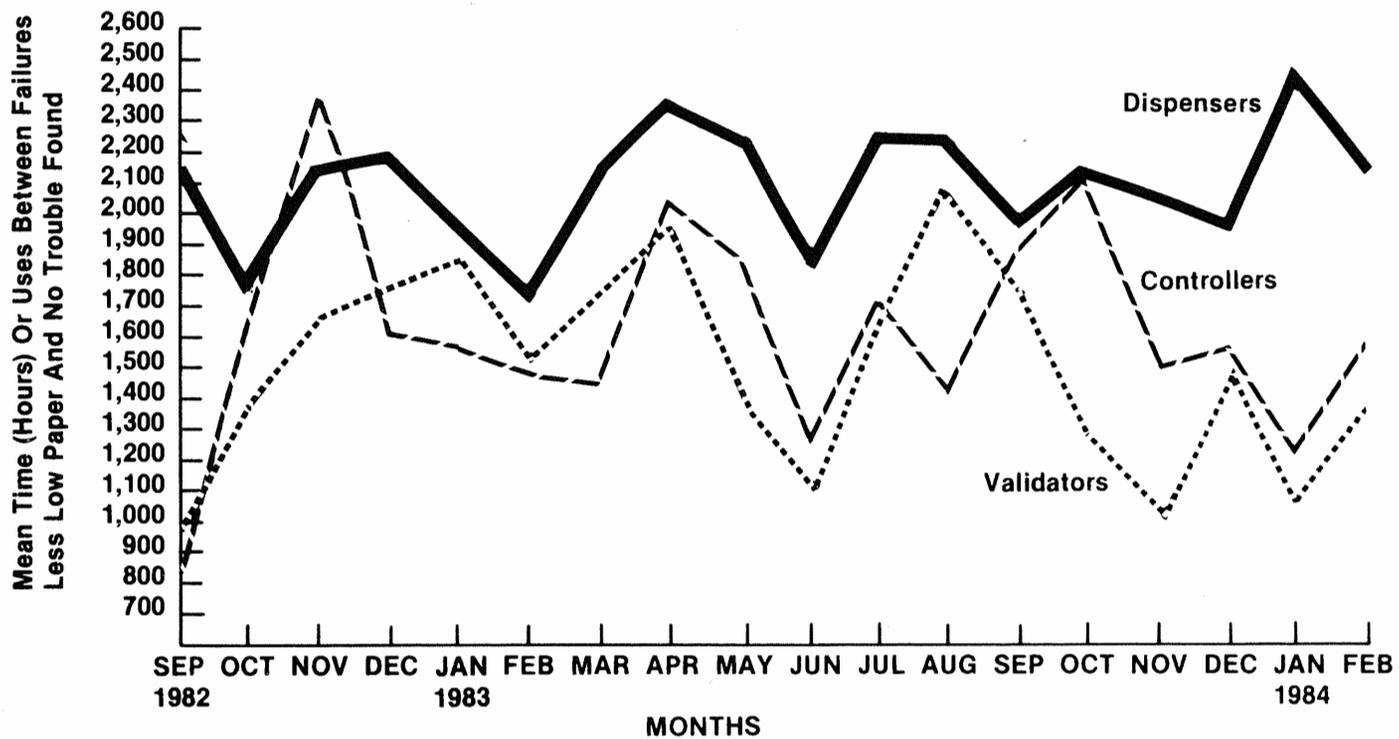
4.5.2 Dispensers

Paper jams accounted for nearly half the dispenser problems (Figure 4-5). TRI-MET tried to reduce paper jams by changing from 24-pound paper stock to 60-pound paper. This change had little effect on dispenser paper jams as the problem was in the design of the ticket feed module.



Source: TRI-MET

FIGURE 4-2. SSFC EQUIPMENT PERFORMANCE BETWEEN FAILURES



Source: TRI-MET

FIGURE 4-3. SSFC EQUIPMENT PERFORMANCE BETWEEN SHOP REPAIRS

TABLE 4-3

SSFC EQUIPMENT AVERAGE MONTHLY AND DAILY FAILURES
(June 1983 - February 1984)

<u>Unit</u>	<u>All Failures</u>	<u>Failures Less Low Paper/ No Trouble Found</u>	<u>Failure Requiring Shop Repairs Less No Trouble Found</u>
		<u>Monthly</u>	
Controllers	394	384	69
Dispensers	2,691	2,053	498
Validators	812	776	297
		<u>Daily</u>	
Controllers	12.9	12.6	2.3
Dispensers	88.4	67.4	16.4
Validators	26.7	25.5	9.7

TABLE 4-4

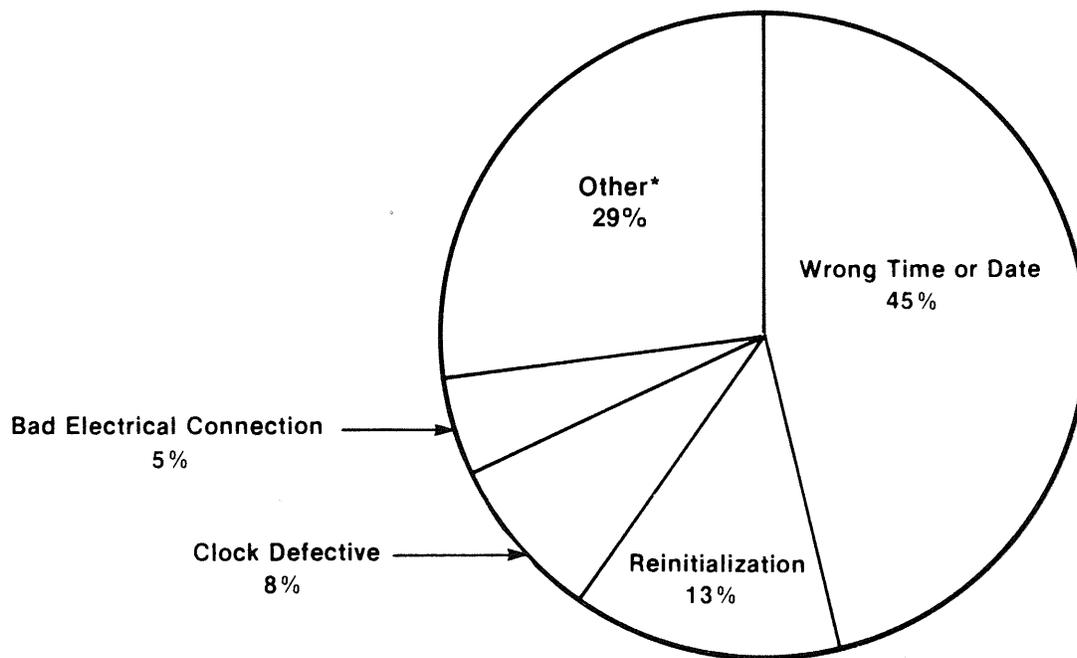
TRI-MET SSFC EQUIPMENT FAILURE DEFINITIONS

Bad Electrical Connection	Poor electrical connection between the controller and the batteries.
Blown Fuse	Blown fuse in the dispenser or validator.
Clock Defective and Wrong Time or Date	Malfunctioning controller which causes the dispenser or validator to print the incorrect time or date.
CPU Board Bad Order	Malfunction of the micro-processor for the dispenser or validator.
Large Battery Dead	Dead 4-volt battery added to the controller to boost the battery voltage from 12 to 16 volts.
Lock Defective/Broken	Broken lock on the dispenser case.
Mechanical Adjustment	General mechanical failures of the dispensers or validators.
Other	Miscellaneous category for problems with the controller, validator, or dispenser.
Paper Feed Bad Order	Breakdown of the dispenser paper feed mechanism.
Paper Jam	Paper blockage in the dispenser which prevents the ticket from being issued.
Power Supply Board Bad Order	Malfunction of the dispenser or validator caused by a power overload.
Print Head Bad Order and Print Head Driver Motor Bad Order	Print module failures of the dispensers or validators.
Reinitialization	Interruption of equipment operation caused by electrical interference.
Ribbon Bad Order	Problems with the ink ribbons of the dispensers or validators.
Solenoid Burned Out	Spent solenoid which drives the ticket cutter blades of the validator.

TABLE 4-4 (Continued)

TRI-MET SSFC EQUIPMENT FAILURE DEFINITIONS

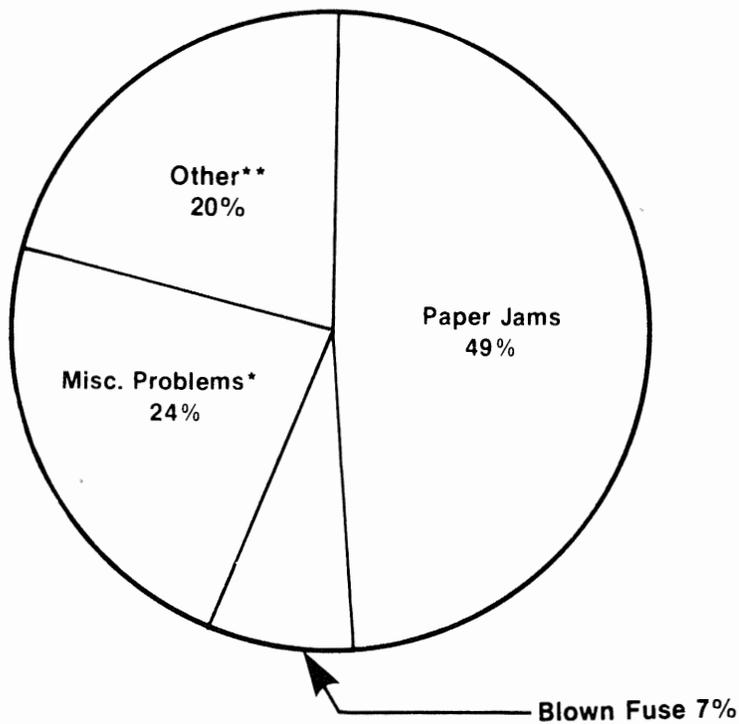
Ticket Feed Bad Order	Failure of the validator to sense the ticket in the slot and initiate the appropriate action.
Ticket Jam	Malfunction of the validator's validating mechanisms.



* Other includes problems which were less than 1 percent of the total.

Source: J.W. Leas & Associates, TRI-MET Self-Service Fare Collection Equipment Update, March 5, 1984 (TRI-MET Data)

FIGURE 4-4. RELATIVE FREQUENCY OF CONTROLLER FAILURES BY TYPE (September 1, 1983 to November 30, 1983)



* Miscellaneous Problems include:

Paper Feed Bad Order	3%
Large Battery Dead	3%
CPU Board Bad Order	3%
Power Supply Board Bad Order	3%
Lock Defective/Broken	2%
Ribbon Bad Order	2%
Reinitialization	2%
Mechanical Adjustment	2%
Print Head Bad Order	2%
Print head Drive Bad Order	2%
<hr/>	
	24%

** Other includes problems which were less than 1 percent of the total.

Source: J.W. Leas & Associates, TRI-MET Self-Service Fare Collection Equipment Update, March 5, 1984 (TRI-MET Data)

FIGURE 4-5. RELATIVE FREQUENCY OF DISPENSER FAILURES BY TYPE (September 1, 1983 to November 30, 1983)

4.5.3 Validators

Ticket jams accounted for 30 percent of validation problems (Figure 4-6). They were caused by riders forcing tickets into the validator while attempting to trigger validation. The introduction of heavier paper stock by TRI-MET helped but did not solve the problem, as the validators relied on the most vulnerable part of the ticket, the corner, to trigger validation. During the first 11 months of operations, riders paid no fare when the validator was not working. As a result, TRI-MET found that occasionally riders purposely jammed validators.

4.5.4 Rear-Door Boarding Equipment

Driver-operated rear-door boarding equipment on standard buses operated well. TRI-MET experienced electrical problems with the driver- and passenger-operated rear-door boarding equipment on articulated buses. Drivers found them confusing to operate because the doors required numerous settings. However, the problems drivers were experiencing with the articulated bus boarding equipment were minor especially when compared with the problems they were experiencing with SSFC equipment.

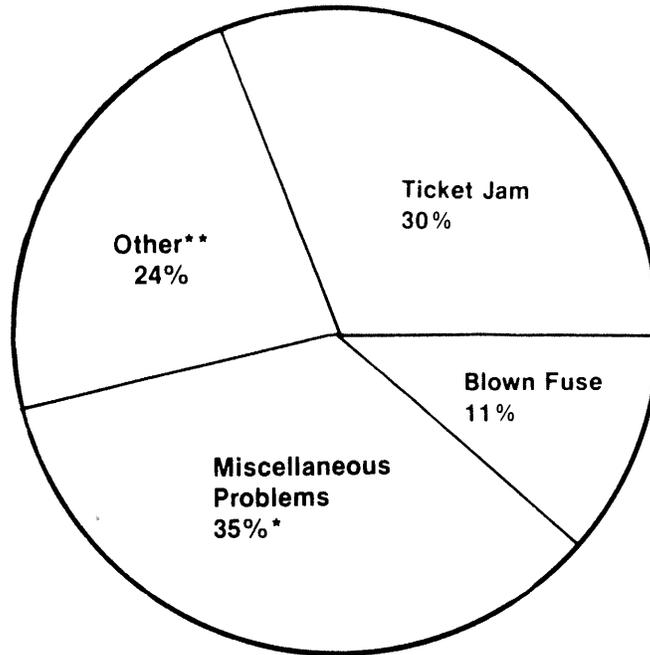
4.6 EQUIPMENT REVIEWS

TRI-MET intended to procure revenue-tested SSFC equipment. However, the equipment that TRI-MET ultimately ordered:

- . was based on a new design that CAMP had tested but had not been used in revenue service; and
- . went through extensive modifications to operate on U.S. buses and to meet TRI-MET's needs.

In 1983, consultants from Electro Scientific Industries and J.W. Leas & Associates reviewed the design of TRI-MET's SSFC equipment. According to the review, the major causes of SSFC equipment failures were the following modifications to the original CAMP equipment:

- . Voltage changes. CAMP originally designed the SSFC equipment for European buses that have 24-volt batteries. Rather than producing a 12-volt design to meet most U.S. bus specifications, the 24-volt design was modified to run on 12 volts. The modifications reduced the reliability of the dispensers and validators. The consultants reported that dispenser and validator performance would have been better if the original 24-volt designs had been used with converters to boost the voltage from 12 to 24 volts.



* Miscellaneous Problems include:

Reinitialization	5%
Large Battery Dead	5%
Ribbon Bad Order	4%
Solenoid Burned Out	4%
Mechanical Adjustment	3%
Print Head Bad Order	3%
Print Head Drive Motor Bad Order	3%
Lock Defective/Broken	2%
CPU Board Bad Order	2%
Power Supply Board Bad Order	2%
Ticket Feed Bad Order	2%
	<hr/>
	35%

** Other includes problems which were less than 1 percent of the total.

Source: J.W. Leas & Associates, TRI-MET Self-Service Fare Collection Equipment Update, March 5, 1984 (TRI-MET Data)

FIGURE 4-6. RELATIVE FREQUENCY OF VALIDATOR FAILURES BY TYPE (September 1, 1983 to November 30, 1983)

- . New semiconductor chips. To comply with Buy American laws, CAMP/Vultron procured semiconductor chips from U.S. suppliers as opposed to French suppliers. Subtle differences between the two chips caused some of the equipment problems.
- . Validator changes. TRI-MET's tickets were different from European tickets previously used with the CAMP system. European validators cancelled small tickets by cutting off a corner with a single diagonal cut. TRI-MET's larger 10-ride tickets required that its validators perform square-corner cuts and have wider throats. The consultants found that the cutter actuator lever of the new design was placed to sense the outside corner of the ticket. This corner was often bent, wet, or frayed and thus was not rigid enough to trigger the validator. One solution suggested by the consultant was to extend the validator lever to sense the inside corner of the ticket cut which was usually rigid enough to trigger the validator.
- o Dispenser Changes. CAMP originally designed the dispenser to issue tickets from the front bottom edge of the unit, which would have been inconvenient for passengers. Camp redesigned the dispensers to issue tickets from the top of the units.

Besides the above design modifications that caused SSFC failures, the review found two other design deficiencies. First, the dispenser design did not protect dispensers when the cover was lifted to install new rolls of paper. The lack of protective coverings delayed TRI-MET from training operators to change paper rolls until well into the demonstration. Until operators were trained, changing paper rolls required service calls by road mechanics or supervisors. Higher than expected cash use exacerbated this problem because dispensers issued tickets to cash-paying passengers.

Second, controllers could not be easily removed from buses. Controller replacement took much longer than dispenser and validator replacement, and buses with failed controllers had to be taken out of service.

4.7 MAINTENANCE

TRI-MET contracted with Vultron to conduct on-site equipment maintenance for the first year of operation. Under pressure from its unions, TRI-MET phased in the use of its own mechanics after the first year. A top Vultron mechanic who had been hired by TRI-MET was able to assist in in-house training of mechanics.

4.7.1 Staffing

TRI-MET had 12 mechanics and 5 mechanic's helpers who repaired and serviced SSFC equipment. Two of the mechanics and two of the helpers worked full-time on SSFC equipment; the balance of the mechanics and helpers worked part-time on SSFC equipment at the equivalent of seven full-time positions.

The full-time mechanics and helpers worked out of a van on the transit Mall. They worked in two shifts with a mechanic and a helper on each shift. TRI-MET's three garages had two mechanics on each shift who worked on SSFC equipment.

4.7.2 Procedures

TRI-MET had start-up, maintenance, and road failure procedures for reducing and minimizing the delays caused by SSFC equipment failures.

4.7.2.1 Start-Up Procedures

Before a bus started a run, TRI-MET checked the controller, dispenser, and validator. When one was not functioning properly it was replaced, and the check was repeated. Only when all three units were fully operating could a bus begin its run.

4.7.2.2 Maintenance Procedures

TRI-MET serviced SSFC equipment when a unit was repaired and during the 1,500-mile bus inspections. Service included:

- . cleaning the chad (ticket clippings) from the validators;
- . checking and changing rolls of paper in the dispenser;
- . checking and replacing ink ribbons;
- . cleaning;
- . checking for damage and malfunctions; and
- . replacing units needing repairs.

Bus drivers checked and changed dispenser paper rolls daily during bus runs.

4.7.2.3 Road Failure Procedures

Warning lights on the controllers alerted drivers to SSFC unit failures. When failures occurred, drivers radioed for replacements. TRI-MET had a van on the Mall staffed with

mechanics and mechanic's helpers to repair most units on buses that used the Mall. Mechanics repaired units on the buses if repairs could be made quickly; if not, they replaced units. Road supervisors carried spare units and replaced faulty equipment at layovers for buses that did not serve the Mall or were away from the Mall.

Replacement times for dispensers and validators were relatively short, between 30 and 40 seconds per unit, while controllers required between 25 and 30 minutes. Buses with failed controllers were taken out of service.

4.7.3 Management Information System

TRI-MET developed a computerized management information system (MIS) to:

- . track SSFC equipment location; and
- . collect aggregate equipment performance data.

TRI-MET's centralized Management and Information Analysis Department performed the data processing for the SSFC equipment MIS.

TRI-MET developed two forms for SSFC equipment MIS. One form, the storage issue form, was used to track which bus the equipment was on. Mechanics completed the storage issue form when removing a spare SSFC unit from storage. The other form, the equipment repair form, had two parts, a removal response and a repair report. The removal response section tracked SSFC equipment location. The repair report tracked failure causes and work performed; only failure causes were computerized. Mechanics completed the form for shop repairs. Figure 4-7 presents the equipment repair form.

SSFC managers received weekly SSFC equipment reports, which summarized for each equipment type:

- . total failures;
- . failure causes;
- . failure response time;
- . mean transactions or hours of use between failures;
and
- . shop repair total.

J.W. Leas & Associates, Inc., reviewed TRI-MET's SSFC equipment MIS from the perspective of gaining data needed to

SSFC EQUIPMENT REPAIR

06789

REMOVAL RESPONSE (complete when unit removed from bus)

Date	___/___/___	Time of call	___ AM ___ PM	Time of Response	___ AM ___ PM
Bus Number	_____	Line/Train	_____		
Unit Type (circle one)	Controller	Dispenser	Validator (front)	Validator (middle)	Validator (rear)
Serial Number of Unit Removed	_____	Serial Number of Replacement Unit	_____		
Unit Sent To	1__Stores 2__Maintenance	9__Other (specify)	_____	Reported By	
Reason for Removal					

REPAIR REPORT (complete when unit repaired)

Date Received	___/___/___	Serial Number	_____	Counter Reading (Disp. or Valid.)	_____
Reason for Service (check one)	1__Scheduled Servicing 2__Unit Modification	3__Vandalism 4__Unit Failure		9__Other (specify)	_____

Failure Causes (circle appropriate code)

Controller	Dispenser	Validator
QC1 Clock Defective	QD1 Paper Feed B/O	QV1 Ticket Feed B/O
QC2 Bad Electrical Connection	QD2 Ribbon B/O	QV2 Ribbon B/O
QC3 Blown Fuse	QD3 Ribbon Mechanism B/O	QV3 Ribbon Mechanism B/O
QC4 Battery Dead	QD4 Lock Defective/Broken	QV4 Bad Electrical Connection
QC5 Power Supply Board B/O	QD5 Case Defective/Broken	QV5 Solenoid Burned Out
QC6 CPU Board B/O	QD6 Blown Fuse	QV6 Lock Defective/Broken
QC7 Communication Board B/O	QD7 Ticket Cutter B/O	QV7 Case Defective/Broken
QC8 Front Switch Board B/O	QD8 Paper Advance Motor B/O	QV8 Blown Fuse
QC50 Incorrect Time, Not Programmed	QD9 Print Head Drive Motor B/O	QV9 Ticket Cutter B/O
QC51 Battery Unplugged	QD10 Small Battery Dead	QV10 Battery Dead
QC99 Other _____	QD11 Large Battery Dead	QV11 Print Head B/O
	QD12 Print Head B/O	QV12 Print Head Drive Motor B/O
	QD13 Power Supply Board B/O	QV13 Power Supply Board B/O
	QD14 CPU Board B/O	QV14 CPU Board B/O
	QD15 Ticket Counter B/O	QV15 Counter B/O
	QD16 Solenoid Burned Out	QV51 Battery Unplugged
	QD50 Out of Paper	QV99 Other _____
	QD51 Battery Unplugged	
	QD99 Other _____	

Work Performed

Work Performed		
Unit Returned to Manufacturer	Date Sent Work: ___/___/___	Date Returned ___/___/___

Date Work Completed	___/___/___	Time	___ AM ___ PM	Repair Time (Hours:Minutes)	___	Repaired By	
Unit Sent To	1__Stores 5__Van # ___	3__Bus # ___	4__Car # ___	6__Withdrawn from Service		9__Other (specify)	_____

FIGURE 4-7. EQUIPMENT REPAIR FORM

follow equipment fixes and repairs. It recommended four improvements:

- . record controller time of failure;
- . record dispenser and validator transactions for on-board repairs;
- . computerize work performed, and
- . record equipment modifications.

TRI-MET did not have the resources to implement the recommendations. As it was, the MIS required substantial resources and was becoming more detailed than the information TRI-MET gathered on engines. The MIS was already so detailed that workers who were rushed or became sloppy did not fill out all the requested information. The large amount of resources required for SSFC equipment maintenance was one of the reasons why TRI-MET stopped using the equipment and limited SSFC to trips originating in Fareless Square.

5. MARKETING AND TRAINING

TRI-MET implemented self-service fare collection and a new zone system, new crosstown service, and a fare increase, all at the same time. SSFC implementation was handled in this way to maximize marketing dollars spent; to minimize confusing the public; and to limit the number of training programs needed for the public and employees. TRI-MET and its marketing agency, Borders Perrin Norrander, therefore developed a comprehensive marketing and training program that covered all the service changes. The manager of public information and marketing for SSFC directed the program.

TRI-MET's objectives for the marketing and training program were to:

- . explain SSFC;
- . explain and promote the new fare prepayment options;
- . explain the new zone system and fare levels;
- . explain the new crosstown service; and
- . encourage acceptance of SSFC and the new zone system.

TRI-MET identified its target groups and used several media and distribution methods to reach these groups (Table 5-1).

An important element of TRI-MET's marketing program was its press liaison. It did not just react to inquiries from the press; rather, it initiated contacts to generate local and national press coverage. TRI-MET listed all contacts, sent them press releases and marketing materials, and invited them to all training and marketing programs. The results were that TRI-MET developed good relations with the local press and generated coverage of the SSFC programs. This coverage proved integral to TRI-MET's efforts to inform the public of SSFC and other service changes.

TRI-MET estimated that the marketing and training program cost \$500,000.* This amount covered marketing and training for SSFC and other service changes.

* TRI-MET could not provide a detailed cost breakdown for the marketing program because the \$500,000 included money from several different budgets and sources.

TABLE 5-1

OVERVIEW OF TRI-MET'S SSFC MARKETING PROGRAM

Target Groups	Mediums	Distribution Methods
<p>General Public</p> <p>Current and Potential Riders</p> <p>Youths</p> <p>Senior Citizens</p> <p>Handicapped Persons</p> <p>Employers</p> <p>Indo-Chinese Community</p> <p>Ticket and Pass Sales Outlet Personnel</p> <p>Employees</p>	<p>Printed Materials</p> <p>Posters</p> <p>Slide Shows</p> <p>Print Ads (Newspapers, Transit)</p> <p>Broadcast Ads (TV, Radio)</p>	<p>Mobile Information Stations (Bus School)</p> <p>On-Site Information Personnel ("Ask Me" Program)</p> <p>Mail by Request</p> <p>Group Presentations</p> <p>Mall Information Kiosks</p> <p>Pass and Ticket Outlets</p> <p>TRI-MET Customer Assistance Office</p> <p>Buses "Take One" Racks</p> <p>Telephone Information</p> <p>Training Sessions</p>

TRI-MET conducted the marketing and training program in three phases:

- . Program Development and Employee Training;
- . Public Education; and
- . Final Marketing Effort.

A discussion of these phases and an evaluation of the program follows.

5.1 PROGRAM DEVELOPMENT AND EMPLOYEE TRAINING

TRI-MET and its advertising agency conducted an intensive 8-month program development and employee training effort. TRI-MET maintained that informed employees are motivated employees who can serve as public relations agents and greatly expand the public information effort.

5.1.1 Operators

TRI-MET's operator training course was called Advanced Driver Development (ADD). This 40-hour course offered training in:

- . the new equipment (SSFC equipment, articulated buses, and the computerized radio system);
- . customer relations;
- . emergency response;
- . accident prevention; and
- . disabled rider service.

TRI-MET organized the ADD program as a series of 5 8-hour classes. Each class accommodated 25 operators, and all operators completed a class before TRI-MET presented the next class in the series.

For the ADD classes, TRI-MET developed and presented to the operators a 10-minute SSFC training video tape, a glossary of SSFC terms, and an SSFC operator manual. The video presented SSFC history, potential benefits, bus operation, fare inspection; driver duties, equipment, tickets, fare zones, fare structure, and customer relations. The video tape, which took the operators' perspective, showed the operator what to do in selected situations.

In addition to the ADD classes, TRI-MET sent its operators, supervisors, and mechanics to Bus School. Bus School, the centerpiece of the public information campaign, is discussed in subsection 5.2.

5.1.2 Customer Relations and Information Staff

TRI-MET held three seminars for its customer relations and information staff. These seminars provided detailed information on the September 5 changes and gave the employees a positive attitude toward the changes. TRI-MET considered both objectives important because these employees dealt directly with the public. Each seminar had three sessions; class size was limited to 25.

The first seminar, held in November 1981, lasted one hour and presented information on fare, zone, and SSFC changes. Even though SSFC was scheduled for September 5, TRI-MET believed the November seminar was productive because it provided a solid background for subsequent seminars.

TRI-MET held the second seminar in April 1982. This 1-hour seminar updated SSFC information and explained TRI-MET's public information campaign. Staff received a schedule and an outline of questions callers might ask, and participated in a mock Bus School lesson to prepare them for what the public would experience.

In July 1982, TRI-MET held a 4-hour seminar for telephone information personnel. This session explained SSFC and other changes and suggested how to deal with job stress.

In addition to the seminars, TRI-MET distributed SSFC publications and materials as they became available.

5.1.3 Other Employees

TRI-MET used its employee information programs to inform employees of SSFC and other service changes. Programs consisted of the general manager's scheduled talks to employees and the employee newsletter Fare Exchange. In addition to regular articles on SSFC in Fare Exchange, TRI-MET published a supplement that explained the Bus School program.

5.2 PUBLIC EDUCATION

For the public education campaign, TRI-MET and its advertising agency developed the Bus School program. The theme of the campaign was that SSFC would speed up bus service.

TRI-MET painted three buses school-bus yellow and used them in a 10-minute program that explained future service changes. TRI-MET and its advertising agency developed:

- . a slide show;
- . a brochure;
- . lesson cards; and
- . an advertising campaign.

The buses used in this program contained SSFC equipment which was used for demonstrations. Fare inspectors were the Bus School instructors.

Between April 27 and July 31, 1982, Bus School ran Tuesdays through Saturdays. TRI-MET, under an agreement with a local retail chain, parked its Bus Schools in front of the stores at area shopping malls and centers. Bus School traveled to hundreds of other locations in the TRI-MET service area including schools, senior centers, employment sites, banks, hotels, hospitals, fairs, and even a parade site.

During August and September, TRI-MET used one bus to visit community groups, major employers, and special events. Groups could request Bus School. Requesters completed a form and sent a map of where the bus should park.

On April 22, TRI-MET began its Bus School marketing campaign with a press conference. TRI-MET ran newspaper, radio, and transit advertisements to encourage Bus School attendance. Transit advertisements included tear-off Bus School schedules for patrons to take. The advertising campaign took a humorous, slightly goading tone. One poster read "People who don't attend Bus School may flunk our September 5 entrance exam." Figure 5-1 presents examples of Bus School marketing materials.

5.3 FINAL MARKETING EFFORT

TRI-MET and its advertising agency designed the final marketing effort to convey detailed information and to reduce rider apprehension. The effort comprised:

- . printed material distribution;
- . an all-media campaign;
- . an on-site information program;

Bus School
Hand-Out Pamphlet

Newspaper Campaign

YOU HAVE UNTIL SEPT. 5TH TO LEARN WHAT'S INSIDE

PEOPLE WHO DON'T ATTEND BUS SCHOOL MAY GET THEIR OWN PRIVATE TUTORING.

PEOPLE WHO DON'T ATTEND HARD KOUR ERE. AM.

ON SEPTEMBER 5TH TRI-MET GOES A WHOLE NEW ROUTE.

TRI-MET

NOTE: [unreadable]

Free Bus School Pennants

Interior Car Cards

DON'T WAIT UNTIL SEPT. 5TH TO DISCOVER TRI-MET'S NEW SELF-SERVICE TICKET MACHINES.

ATTEND BUS SCHOOL

FIGURE 5-1. BUS SCHOOL MARKETING MATERIALS

- . special programs; and
- . an employee motivation program.

Figure 5-2 presents the marketing materials used in the final marketing effort.

5.3.1 Printed Material Distribution

During the final marketing effort, TRI-MET distributed brochures, pamphlets, and tabloids. The central, comprehensive, printed information source was the Speed Riding Manual. Printed on newspaper stock, this 16-page tabloid explained:

- . What is SSFC?
- . How does one use SSFC equipment?
- . What are the new pre-payment options?
- . What are the new zones?
- . What is the new crosstown service?

The theme of the manual was the same as that of the whole marketing effort--SSFC would speed up bus service. TRI-MET distributed Speed Riding Manuals widely. Appendix B presents selected pages of the manual.

TRI-MET and its advertising agency developed a Fare Zone Guide. This guide explained the new fare payment options and new zone structure. TRI-MET distributed the guide from its ticket outlets and downtown Portland Transit Mall information kiosks. As part of this effort, TRI-MET conducted information sessions for ticket outlet personnel so they could answer purchasers' questions.

In addition to new materials, TRI-MET updated all its brochures regarding special services and programs. TRI-MET featured the September 5 changes in its September-October 1982 issue of Riders' Digest. This bi-monthly pamphlet is distributed through its "Take One" racks on the buses.

5.3.2 All-Media Campaign

TRI-MET's 7-week all-media campaign used radio, television, newspaper, and transit advertisements to alert people to the

Newspaper Campaign

WILL YOU BE EQUIPPED FOR TRI-MET'S NEW SPEED EQUIPMENT?

THANKS TO SELF-SERVICE BOARDING, DON'T LEARN MAY STAND AMERICA'S R. DIRECT OF TRI-MET KIP TOWN.

AMERICA'S FASTEST BUSES ARE COMING TO PORTLAND SEPT. 5

Special Audience Posters

HOW TO SPEED TO AND FROM SCHOOL WITHOUT GETTING BUSTED.

AMERICA'S FASTEST BUSES

Take-One Riders' Pamphlets

RIDERS' DIGEST

ALMOST HERE!

AMERICA'S FASTEST BUSES

TRI-MET

Two TV Commercials

TRI-MET

AMERICA'S FASTEST BUSES

16-Page Tabloid

TRI-MET

SPEED RIDING MANUAL

THE HOW WHEN AND WHERE OF RIDING AMERICA'S FASTEST BUSES.

Featuring:

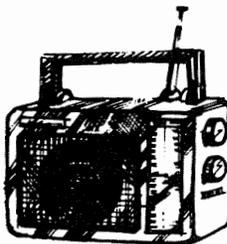
- Rapid Self-Service Fare Equipment
- Handy New Tickets and Passes
- Streamlined Dual-Door Boarding
- Easy Transferring
- Quick and Courteous Fare Inspectors
- More Equitable S-Zone System
- And last, but hardly least, Faster, More Direct Routes that Skip Downtown.

Fare Exchange

WE'RE ALL GOING ON RIDING SEPT. 5

EXCHANGE, YES!

Assorted Internal Publications



Two Radio Commercials

TRI-MET TRAVEL GUIDE

THE TICKETS, ZONES AND ZONES OF AMERICA'S FASTEST BUSES

Fare Outlet Ticket Guide

THANKS TO SELF-SERVICE BOARDING, AFTER SEPT. 5 YOU PROBABLY WON'T BE STANDING IN LINE LONG ENOUGH TO FINISH READING THIS SIGN. & TRI-MET

Exterior Transit Board

PASS OR TICKET HOLDERS ENTER ANY DOOR

Extensive On-Bus Signage



ON YOUR MARK, GET SET, BOARD

PORTLAND HAS AMERICA'S FASTEST BUSES & TRI-MET

Exterior Transit Board

FIGURE 5-2. MARKETING MATERIALS FOR FINAL MARKETING EFFORT

changes and to encourage them to obtain printed materials. TRI-MET conducted the campaign in three phases:

- . General awareness campaign from August 8 to 21. TRI-MET used television primarily with some newspaper, transit, and radio advertisements. The objective was to alert the public that changes were to occur.
- . Informational campaign from August 22 through September 12. TRI-MET primarily used newspaper with some television, transit, and radio advertisements. The objective was to provide the specifics of the changes that were to occur.
- . Follow-up campaign from September 8 to 28. TRI-MET used transit primarily with some radio advertisements. The objectives were to inform passengers that the changes had taken place and to emphasize the benefits of the changes.

TRI-MET and its advertising agency designed the advertisements to get attention. The advertisements encouraged listeners, readers, or viewers to send for the Speed Riding Manual. TRI-MET placed the newspaper advertisements in city, suburban, and organization papers. The television advertisements covered early morning talk shows, afternoon soap operas, prime time, and late night time.

5.3.3 On-Site Information Program

During the first week of SSFC operations, TRI-MET conducted its on-site information program, called "Ask Me," using over 100 volunteer TRI-MET employees and Comprehensive Educational Training Act (CETA) personnel. "Ask Me" personnel, after a 4-day training program, were stationed on the downtown Portland Transit Mall and at main transfer points. They carried canvas bags of brochures, timetables, and rider guides and wore vests, T-shirts, or hats labeled "Ask Me." This on-site information program helped patrons who were confused during the first week of changes.

5.3.4 Special Programs

TRI-MET conducted special marketing programs for groups of its riders with special needs.

For Indo-Chinese, TRI-MET:

- . translated its Speed Riding Manual into Vietnamese, Cambodian, and Laotian and distributed it to community centers and businesses.

- . conducted an SSFC training session for over 50 people who worked with recent Indo-Chinese refugees.
- . equipped a Bus School with a translator and visited an Indo-Chinese refugee center.
- . hired three Vietnamese youths as "Ask Me" personnel to help the Indo-Chinese during the first week of SSFC.
- . assigned a member of its marketing department to coordinate the Indo-Chinese program. (This coordinator participated in cultural awareness training and attended forums for groups who work with the Indo-Chinese.)

For special services users, TRI-MET:

- . held training sessions at seniors centers;
- . held training sessions at community agencies. (These training sessions consisted mainly of changes to their special programs.)

For employers, TRI-MET:

- . provided training and brochures to site transportation coordinators.
- . distributed special posters designed to be hung at employment sites.
- . briefed its buspool* patrons on September 5 changes to routes, schedules, and fares.
- . conducted a sales program. (This program was to increase the number of employers selling passes to employees.)

For students, TRI-MET:

- . provided college students with information that was included in the students' registration packets.

* A buspool is a subscription bus service that TRI-MET provides to a company or an area. It charges regular fares for this service but requires 40 guaranteed riders.

- . provided high schools with materials to distribute to students, met with high school officials, and distributed special posters to high schools. (TRI-MET made a special effort to reach high school students because they were eligible for youth fares and were viewed as susceptible to fare evasion.)

5.3.5 Employee Motivation Program

TRI-MET conducted its employee motivation program to encourage: (1) an extra effort by employees for the September 5 changes; (2) a positive attitude among employees toward the changes; and (3) a special commitment by employees to the success of the changes.

An important element in TRI-MET's employee motivation program was keeping employees informed of the changes. In mid-August 1982, TRI-MET distributed September 5 information kits to all its employees. The kits contained a Speed Riding Manual, a Fare Zone Guide, and a Transportation Guide and Map. Operators also received the SSFC Operator Survival Kit, fact sheets concerning new bus training sessions, and new bus schedules and route information.

Leading up to implementation, TRI-MET:

- . placed red stickers with the slogan "We've got a lot riding on September 5" on employee handouts and throughout offices; and
- . hung banners in the report area of its garages saying, "'If TRI-MET drivers can't make September 5 work, no drivers in America can!' J.E. Cowen" (General Manager).

Over the first three days of SSFC, TRI-MET gave all its operators a roll of Lifesaver candies, beginning with the first operator sign-in at 3:30 a.m. Attached to each roll was the message "'Give it your best shot.' J.E. Cowen."

After September 5, to thank its employees TRI-MET:

- . sent boxes of doughnuts to all departments with bright orange cards which said "Thanks for getting us through the September 5 crunch!";
- . sent approximately 500 letters of recognition to selected employees;
- . gave non-union employees who had put in extra hours on the project up to three compensatory days off;

- . gave key project staff an acrylic paperweight containing a miniature copy of the Speed Riding Manual; and
- . sponsored an after-work party for all employees.

In September, TRI-MET published a supplement to its employee newsletter with pictures of employees working toward the September 5 changes. The supplement presented a letter from the general manager encouraging employees to work for the success of implemented changes.

5.4 MARKET PROGRAM EVALUATION

This subsection presents an evaluation of TRI-MET's SSFC marketing program. It discusses:

- . market penetration;
- . information sources; and
- . public perceptions of the marketing program.

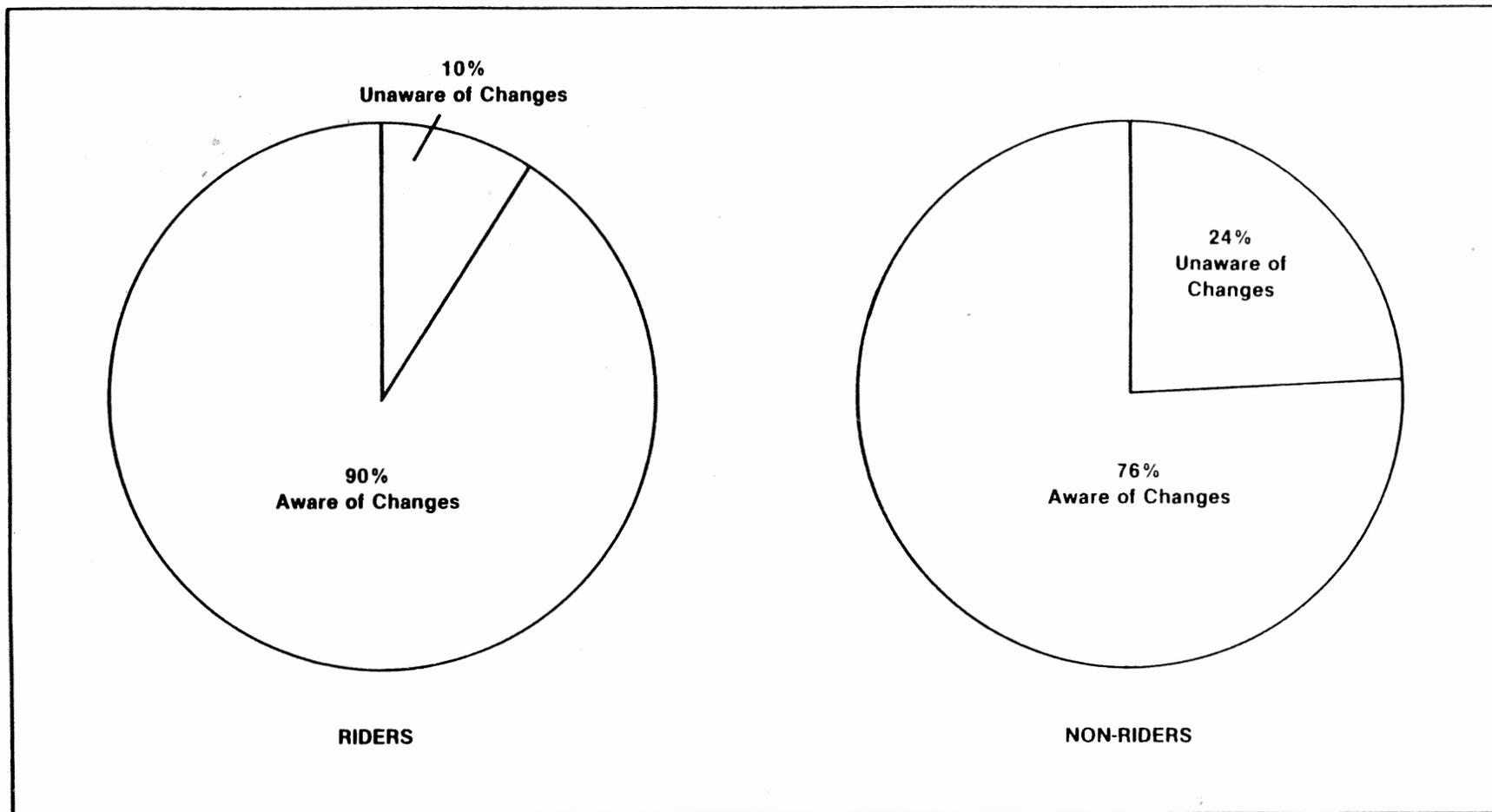
Unless otherwise noted, the data source for this discussion was a household telephone survey. This survey, conducted October 1982, one month after SSFC implementation, contacted 500 TRI-MET riders and 500 non-riders. Appendix A presents copies of the household surveys.

5.4.1 Market Penetration

TRI-MET was successful in alerting most people to the September 5 service changes. As shown in Figure 5-3, 90 percent of riders and 76 percent of non-riders said they were aware of TRI-MET service changes. The non-rider awareness is impressive, considering their non-use of the service.

TRI-MET was successful not only in creating a general awareness of the service changes, but also in relaying specific information. This information was needed to teach people how to use SSFC. Shown below are the percentages of riders and non-riders who were aware of the service changes.

<u>Service Changes</u>	<u>Riders</u>	<u>Non-Riders</u>
Fare inspectors	92%	68%
New fare payment procedures	79	62
New routes and schedules	51	35
New buses	22	25
New fares and zones	20	17
Other changes	13	8



Source: TRI-MET Household Survey, October 1982.

FIGURE 5-3. AWARENESS OF TRI-MET SERVICE CHANGES

Two measures of whether TRI-MET was successful in informing Portlanders of the service changes were (1) whether people were confident in their ability to use TRI-MET after the changes; and (2) how the confidence levels compared with levels before the changes.

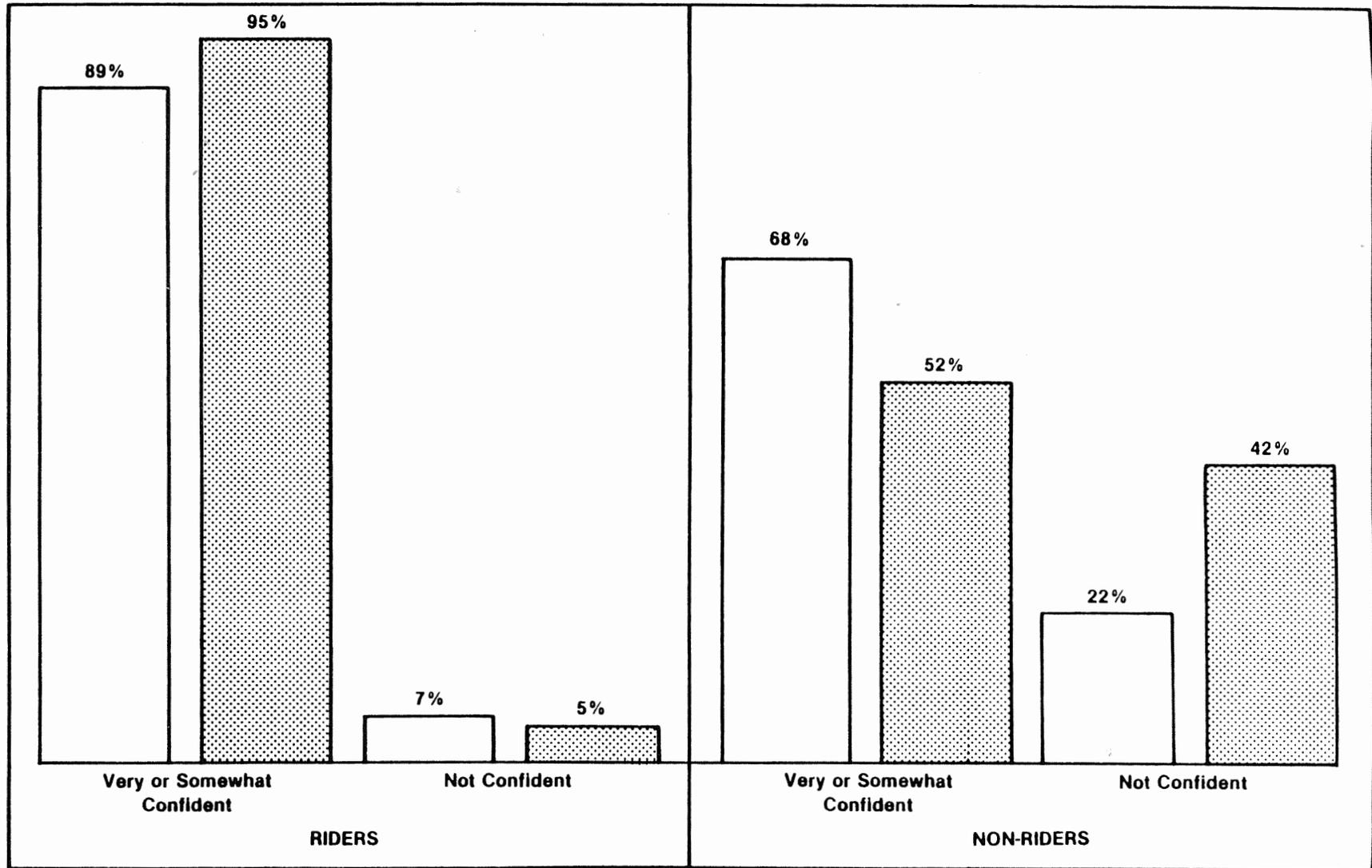
Figure 5-4 shows that before SSFC, riders were confident of their ability to use TRI-MET, and after SSFC was implemented, this confidence increased. Non-riders were less confident of their understanding of SSFC than of the former fare collection system, but more than half believed they understood SSFC. These results are noteworthy when considering that almost none of the respondents had prior experience with SSFC.

The household survey findings were confirmed by comparing the before and during SSFC rider surveys:

- . The percentage of riders who were certain about time limits and when to pay extra fare rose slightly, while the percentage of those who were uncertain stayed nearly the same. The percentage of respondents who were undecided declined. These findings are important in that before SSFC, time limits applied only to transfers, while during SSFC they applied to all cash and ticket fares. The increase in time limit applicability could easily have increased rider uncertainty over the limits.
- . The percentage of riders who were certain about zone boundaries and when to pay the extra fare rose slightly, while the percentage of those who were uncertain also rose slightly. The percentage of respondents who were undecided declined. These findings are important in that the increase in the number of zones during SSFC could easily have increased zone boundary uncertainty substantially.

The during-SSFC rider survey found that 64 percent of riders understood the zone and time information on the tickets as compared with 19 percent who did not. (Validated tickets were not used before SSFC.) Overall, 39 percent of the riders found SSFC less confusing, 33 percent found it the same, 17 percent found it more confusing, and 11 percent responded that they "did not know."

An objective of TRI-MET's marketing program was to convince a potentially skeptical public of the advantages of SSFC. When comparing SSFC with the former system, five times as many non-riders thought SSFC would be better than thought that it would be the same or worse. The reason cited by 80 percent of those thinking SSFC would be better was that it would allow for faster boarding--the theme of TRI-MET's marketing program. (Riders' attitudes are not cited because they would have been influenced by SSFC use.)



Source: TRI-MET Household Survey, October 1982

Before SSFC
During SSFC

FIGURE 5-4. CONFIDENCE IN UNDERSTANDING OF THE FARE SYSTEM

5.4.2 Information Sources

The sources of information for those riders and non-riders who were aware of route, schedule, or fare payment changes are shown in Figure 5-5. These findings show that for riders, TRI-MET was the major source of information, followed by television, radio, and newspaper.

5.4.2.1 TRI-MET

Brochures and other handouts were the major information source of those reporting TRI-MET as their information source. Of this group, 49 percent of riders and 55 percent of non-riders reported brochures and other handouts as their information source. Bus School was the next most important source, reaching 24 percent of riders and 28 percent of non-riders in this group. Other TRI-MET sources were signs on buses for 13 percent of riders and 9 percent of non-riders, and bus drivers or fare inspectors for 8 percent of riders.

5.4.2.2 Television, Radio, and Newspapers

Television and newspapers were the major information sources for non-riders, with each reaching approximately three-fourths of those who knew about the changes.

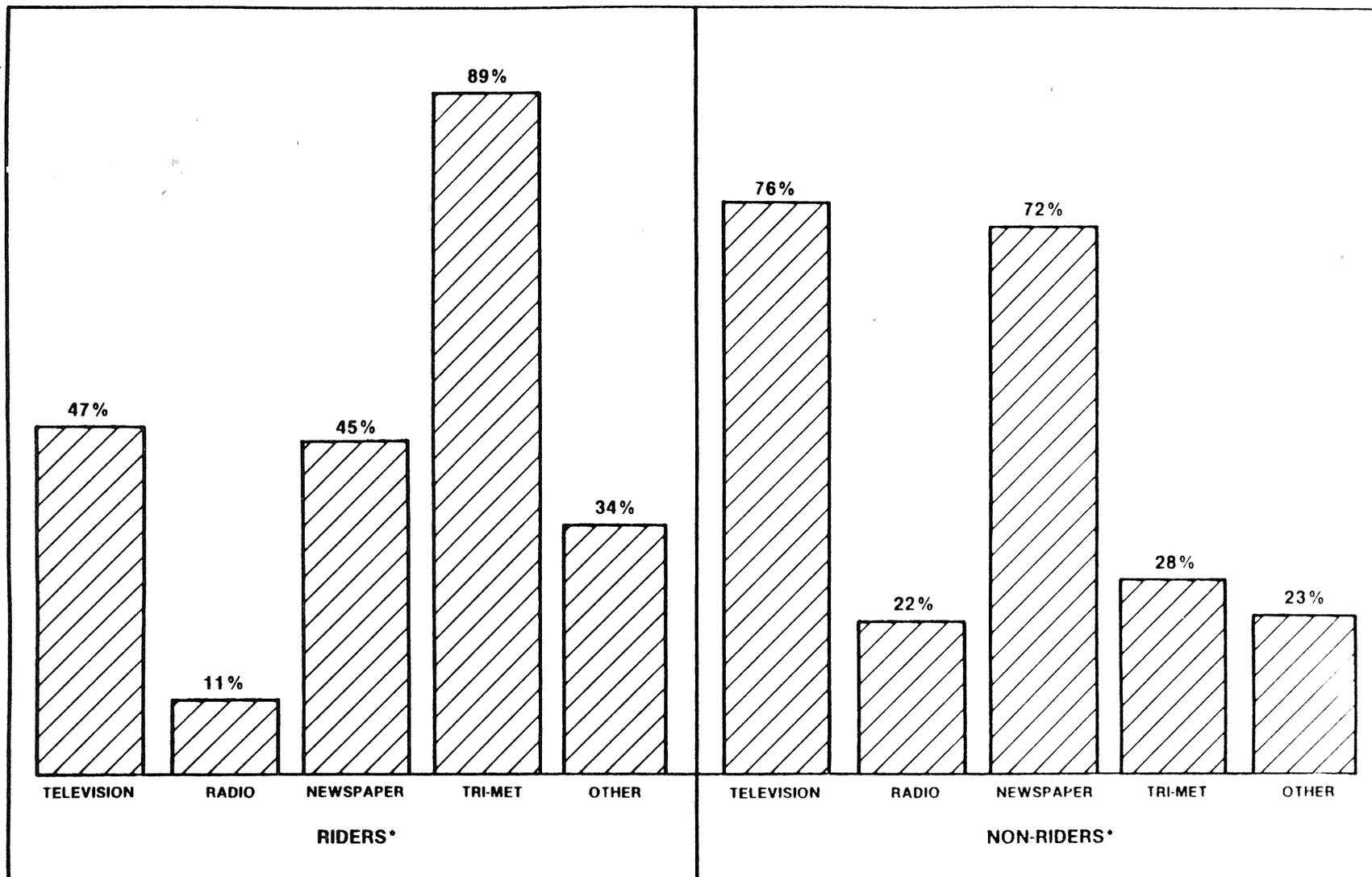
The results have important implications for transit marketing programs: newspapers appear to offer approximately the same coverage as television, at substantial cost savings.

Data from the household survey demonstrated the importance of a press information program. Between 20 and 40 percent of riders and non-riders reporting television and radio as their information source indicated stories, not advertisements, as their source. Newspaper stories were even better information sources, reaching 41 percent of riders and 50 percent of non-riders. TRI-MET's aggressive press liaison program appears to have been instrumental to the success of the marketing effort.

5.4.2.3 Other

Of those reporting "other" as their information source:

- . 53 percent of riders and 60 percent of non-riders reported word-of-mouth as their information source.
- . 14 percent of riders and 19 percent of non-riders reported employers as their information source.



* Those riders or non-riders who were aware of route, schedule or fare payment changes. Respondents could answer more than one source.

Source: TRI-MET Household Survey, October 1982

FIGURE 5-5. SOURCES OF INFORMATION FOR SFC INTRODUCTION

5.4.3 Public Perceptions of the Marketing Program

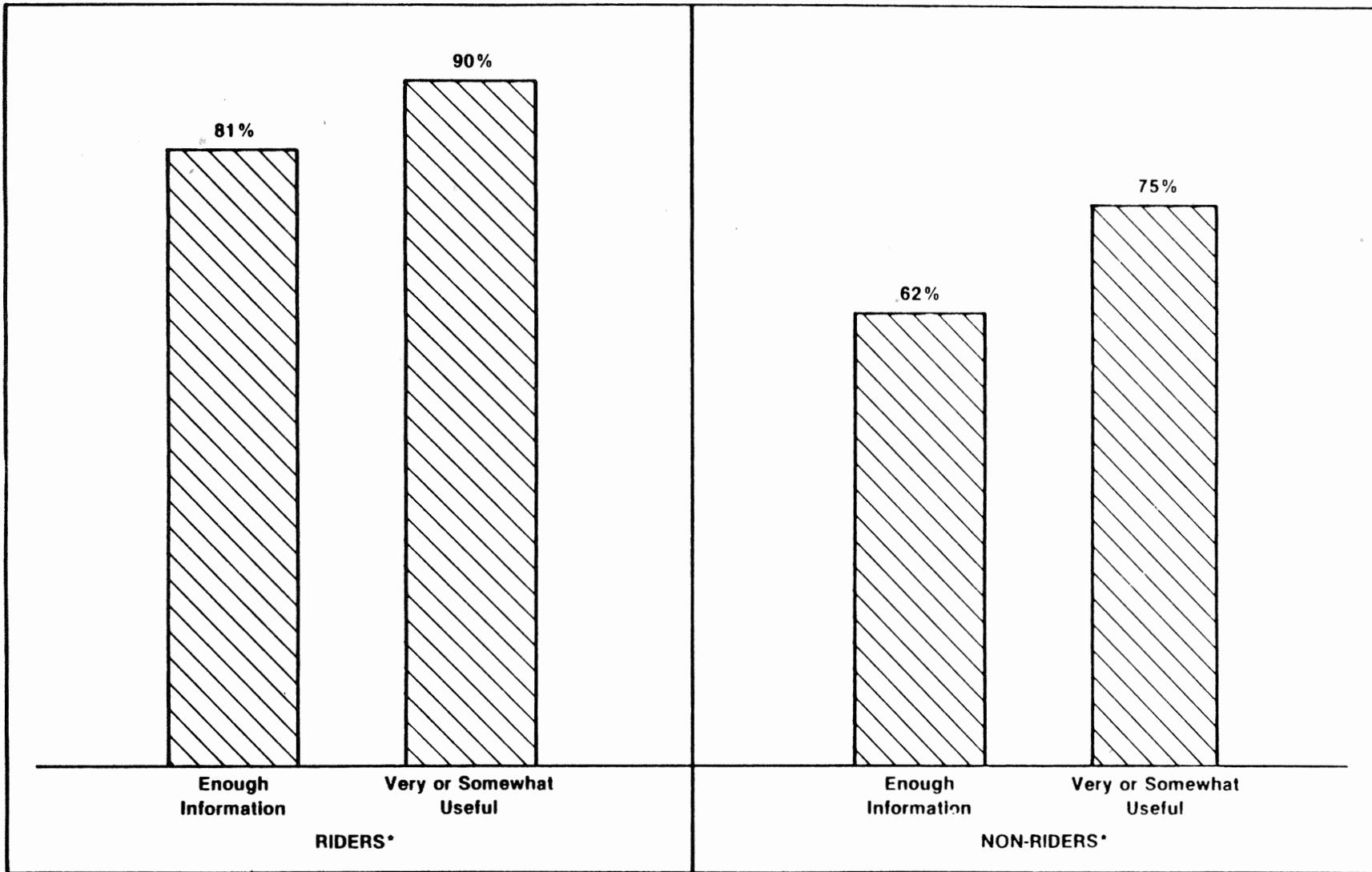
The public rated TRI-MET's marketing program high, and riders rated the program higher than did non-riders. This finding is a credit to TRI-MET because riders had more immediate need for the information than did non-riders. As shown in Figure 5-6, of those aware of route, schedule, or fare payment changes, most considered the information TRI-MET provided to be the right amount and useful.

The ratings remained high when each element of TRI-MET's marketing program was evaluated:

- . Bus School. Of those who attended Bus School, 93 percent of riders and 87 percent of non-riders considered it helpful.
- . Speed Riding Manual. Of those who received the manual, 84 percent of riders and 60 percent of non-riders considered it helpful.
- . "Ask Me" Personnel. Of those who requested assistance from "Ask Me" personnel, 90 percent considered them helpful.

The high ratings by the public indicate a successful and well received marketing program.

73/74



*Those riders or non-riders who were aware of route, schedule or fare payment changes.

Source: TRI-MET Household Survey, October 1982.

FIGURE 5-6. PUBLIC PERCEPTIONS OF AMOUNT AND USEFULNESS OF SSFC MARKETING

6.1.3 Court Challenges

TRI-MET's ordinance survived two court challenges, one in district court and another in small claims court. A person who had received a fare surcharge filed a complaint in district court stating that TRI-MET's fare collection ordinance was:

- . illegal because, in passing the ordinance, TRI-MET assumed judicial powers that by law belong to the courts; and
- . unconstitutional because the surcharge process denied due process--hearings should have been held before a surcharge was issued.

The district court ruled in favor of TRI-MET on both counts. The court findings were that:

- . The ordinance was legal because TRI-MET is a government agency and as such has the power to pass ordinances.
- . The ordinance was constitutional because small claims court hearings constitute due process.

In small claims court, parents of a minor challenged TRI-MET's ordinance contending that they were not liable for the surcharges of their child. The court ruled in favor of TRI-MET.

6.1.4 Amended Fare Evasion Ordinance

TRI-MET eventually amended the fare evasion ordinance to allow citation issuance. TRI-MET experienced problems with evaders who (1) evaded fares repeatedly; (2) provided false names and addresses; and (3) left the bus during inspections. The fare evasion ordinance could not effectively deter these tactics because the only actions permitted were issuing surcharge fares and suing fare evaders in small claims court. TRI-MET amended the ordinance after reaching an agreement with the district court on prosecuting fare evaders. The courts helped TRI-MET redraw the ordinance in accordance with the agreement. The amended ordinance made it unlawful to fail to:

- . pay the applicable fare;
- . carry proof of payment and produce it on demand of a fare inspector; and
- . provide correct name, address, or identification.

The amendment allowed TRI-MET transit police to issue citations to offenders and allowed TRI-MET to conduct civil prosecutions of fare evaders and passengers who provided false identification. Appendix C presents the amended ordinance.

6.2 INSPECTION PLANNING

TRI-MET confronted two important issues while planning the inspection program:

- . level of fare inspection; and
- . number of fare inspectors.

No readily transferable European or North American SSFC experience existed for determining the level of fare inspection in Portland. European systems were too different from TRI-MET to be used as a model. Europe's bus stops were fewer and spaced farther apart, its ridership per vehicle and per bus stop was higher, and it used high-capacity rail networks. Most North American SSFC experience was with light rail lines (Calgary, Edmonton, and San Diego). Transferability of this experience to bus systems was limited because rail systems have a small number of high capacity vehicles, while bus systems have a large number of low capacity vehicles.

TRI-MET decided on an inspection level of 6 percent. The 6 percent level is higher than the European level of 2 percent.

Using European ridership and inspection data, TRI-MET estimated that an inspector could inspect 36 passengers' proof of payment an hour. Using TRI-MET's ridership and an inspection rate of 6 percent, TRI-MET estimated it needed 44 full-time fare inspectors. However, TRI-MET decided to hire 30 full-time and 30 part-time fare inspectors.

6.3 INSPECTOR SELECTION

TRI-MET's labor contract required it to choose fare inspectors from the ranks of bus operators on the basis of seniority, provided they:

- . maintained a good attendance record;
- . had few rider complaints in their personnel files;
- . passed a reading, writing, and reasoning test;
- . completed successfully the extensive training course; and
- . completed successfully a 90-day probationary period on active duty.

Fare inspector selection took four weeks. First, TRI-MET posted a job notice for a week. TRI-MET then reviewed the attendance records and personnel files of the 140 bidders.

Those with good attendance records and personnel files were tested for reading, writing, and reasoning. A week before the test, TRI-MET gave applicants information on SSFC and a description of the fare inspector's job. To refer to during the test, TRI-MET gave applicants an SSFC information booklet. The test asked applicants how they would handle hypothetical situations. TRI-MET ranked those applicants who passed the test by seniority and chose the top 60.

Initially, TRI-MET believed that limiting inspector selection to bus operators would limit the number of applicants. Many qualified operators applied, however, and TRI-MET now sees the following advantages in its recruiting method:

- . Operators already knew the bus system, the other drivers, and each other.
- . TRI-MET already had reliable records on each operator.

TRI-MET recommended that when inspectors are chosen from among operators, the inspector position should be an elevated position with more pay. TRI-MET paid inspectors the same hourly wage as they paid bus operators, but inspectors' pay actually was tantamount to a pay cut as, unlike bus operators, inspectors did not work overtime. As a result, TRI-MET lost some inspectors. The inspectors viewed their position as a promotion and believed they should have been paid more than operators.

6.4 INSPECTOR TRAINING

TRI-MET's decision that fare inspectors be customer assistance personnel instead of transit police influenced the inspector training program. The program strongly emphasized human skills development.

The fare inspector training program comprised 80 hours of classroom instruction and 30 hours of road instruction. TRI-MET hired a professional trainer for the instructions. Sessions were held at a local college for groups of 10 to 15. The training included instruction on:

- . TRI-MET;
- . SSFC;
- . routes, zones, and fares;
- . radio communications;
- . civil liability;

- . proof of payment;
- . forgery detection;
- . human relations;
- . public information;
- . stress management;
- . cardio-pulmonary resuscitation; and
- . fare inspection techniques.

TRI-MET dropped plans to include self-defense training as the use of physical force was found to be unnecessary.

TRI-MET spent considerable time training inspectors in fare inspection techniques. Role-playing was used, and the inspectors alternated between the role of inspector and the role of passenger. Passenger roles included irate, lost, mentally handicapped, elderly, foreign, and suicidal passengers. Role-playing took place both in the classroom and on buses. Instructors videotaped classroom situations, and the class and instructors reviewed each inspector's conduct.

Inspectors were the instructors for the Bus School program (the public education campaign). Bus School gave the inspectors the opportunity to practice their communication skills and meet the public, and it gave the public a chance to meet the fare inspectors.

During August 1982, the month before SSFC, inspectors rode the buses, introducing themselves to passengers, explaining SSFC changes, and encouraging questions from riders. In addition to the experience it gave the inspectors, riding the buses proved a valuable public relations tool that created a positive image of fare inspectors.

6.5 INSPECTION

Inspectors usually worked in groups of two. One inspector boarded the bus through the front door, and the other boarded through the back door. They then announced the inspection. Inspectors asked passengers without valid proof of payment for their name and identification and explained TRI-MET's fare policy. Inspectors suspecting that the passenger was lying or was a repeat offender called for a passenger check, using two-way radios. Operators were stationed at computer terminals with on-line access to the surcharge data base.

- . If the passenger was a first-time offender, the inspector gave an oral warning or issued a fare surcharge.

- . If the passenger was a repeat offender, the inspector issued a fare surcharge.
- . If the passenger provided false identification, computer operators cross-checked the passenger's name, address, and telephone number using a reverse mail or telephone directory. Inspectors confronted the passenger if a discrepancy was found. The passenger usually then provided a correct name and address. Inspectors called transit police if the passenger again gave them false information.
- . If the passenger refused to present identification an inspector signaled his or her partner to call the transit police. The inspector attempted to keep the passenger on the bus until the police arrived. The police could issue a citation and could detain the passenger.

Inspectors put the passenger's name, address, telephone number, type of identification and other detailed information on the fare surcharge notice. Both the passenger and the inspector signed the notice.

Inspectors either issued surcharges on the bus or escorted passengers off the bus to issue surcharges. If passengers were first-time offenders or cooperative, inspectors issued surcharges on the bus. If passengers were repeat offenders or uncooperative, inspectors escorted them off the bus to issue surcharges.

6.5.1 Inspector Deployment

TRI-MET deployed inspectors mostly in groups of two; however, for special inspections, TRI-MET used one inspector or groups of three or four. TRI-MET used the following kinds of inspection:

- . Basic inspection employed inspectors in teams of two who boarded buses, asked passengers for proof of payment, and then moved to other buses. All travel was by bus. TRI-MET used basic inspection in inspection districts with several bus lines and high ridership.
- . Roving inspection employed a team of two inspectors and an auto. One inspector boarded the bus while the other followed in the auto. TRI-MET used roving inspection in outlying districts that had only one or two bus lines.

- . Conductor inspection employed teams of two or more inspectors who, stationed at each door, inspected passengers' proof of payment as they boarded. TRI-MET used conductor inspection on routes with high fare-evasion rates.
- . Line blitzing used conductor inspection on every inbound and outbound bus on a high fare evasion route.
- . Uniform inspection employed inspectors in uniforms. The uniforms--dark blue coat, grey slacks, and light blue shirt and tie--were similar to TRI-MET's bus operator uniforms. Most of TRI-MET's inspections were made by uniformed inspectors.
- . Plainclothes inspection employed inspectors who wore street clothes. The purpose was to catch riders who paid only when they spotted uniformed inspectors. Many European systems use plainclothes inspectors.

TRI-MET continually evaluated and modified its inspection techniques to ensure their effectiveness.

6.5.2 Surcharge Guidelines

TRI-MET had informal guidelines that covered issuing surcharges and warnings. TRI-MET did not give surcharges to very old, mentally handicapped, lost, or confused passengers. For expired time violations, passengers with proofs of payment that were within 15 minutes of the expired time were allowed to pay an additional fare in lieu of receiving a surcharge. TRI-MET did this because of the possibilities of late buses and malfunctioning controller clocks, passenger watches, and inspector watches. For zone violations, passengers within one stop of all zone boundaries except Fareless Square were allowed to pay the zone fare in lieu of receiving a surcharge.

The balance of situations were up to the inspectors' judgment. Typically, those perceived as making an honest mistake were given warnings instead of surcharges.

When SSFC first began, TRI-MET issued written warnings to passengers. TRI-MET abandoned this approach because passengers complained that inspectors did not apply the regulations equally. The oral warning, which was less formal than the written warning, was less open to criticism.

6.5.3 Repeat Evader Procedures

TRI-MET had problems with repeat fare evaders. In an effort to deal with the problem, TRI-MET concluded an agreement with the local district court. This agreement held that anyone without valid proof of payment was subject to a citation and

must appear in court. TRI-MET police issued citations to passengers with four or more surcharges. The court sent persons who did not appear for the hearing "show cause" letters (registered letters asking defendants to explain why they did not appear in court). The court rescheduled hearings for those who answered.

For those who did not answer, the court issued a warrant in lieu of custody and levied fines of up to \$250. If these persons were caught on the buses, TRI-MET police issued another citation. If these persons failed to appear in court, the court issued warrants for their arrest, and TRI-MET police then made the arrest. From November 1983 through May 1985 TRI-MET made approximately ten arrests for failure to appear in court. (Exact numbers were not available.)

6.5.4 Inspector and Police Coordination

Coordination among inspectors and with the transit police was integral to the enforcement effort. Inspector calls to the transit police averaged between 10 and 12 times a week. Inspector teams worked out signals that indicated when a partner should call the transit police. Partners usually called the police so that evaders did not become suspicious and try to leave the bus. Issuing citations required close coordination between inspectors and transit police because in Oregon only police officers could issue citations. Inspectors detained the fare evader until the police arrived.

6.6 INSPECTION EXPERIENCE

TRI-MET's inspection rate averaged 2.9 percent of passengers, and inspections per person-hour averaged 20. TRI-MET's inspection rate was higher than European rates of 2 percent but half the targeted 6 percent. Inspections per person-hour also were less than the projected 36 passengers a person-hour. The reasons for the lower inspection rate and inspections per person-hour were inspections in outlying areas with few buses and low ridership, inspections during off-peak hours, and passenger identification checks. Passenger identification checks could take up to a half hour.

The percentage of riders receiving notices and warnings averaged 3.7 and .7 percent, respectively. The number of riders receiving notices averaged 928 a week and those receiving warnings averaged 174 a week. As shown below, a comparison of the types of fare evasion as percentages of total surcharges and warnings shows that no-payment evaders were more likely to be issued surcharges than were other evaders.

FARE EVASION TYPES AS PERCENTAGES OF TOTAL
SURCHARGES AND WARNINGS

<u>Fare Evasion Type</u>	<u>Percentage of Total Surcharges</u>	<u>Percentage of Total Warnings</u>
No Payment	92.3%	51.0%
Expired Proof of Payment	5.1	18.0
Special Fare Misuse	1.9	11.5
Zone Fare Evasion	<u>.7</u>	<u>19.5</u>
TOTAL	100.0%	100.0%

6.7 ADMINISTRATION

TRI-MET established a Fare Inspection Department to manage its inspection program. Figure 6-1 presents an organizational diagram of the Fare Inspection Department.

The two lead inspectors and the 28 full-time fare inspectors made up the core of the inspection force. The 25 part-time fare inspectors were used part of the time for special inspections and used the balance of the time for driving a bus. TRI-MET expected fare inspectors to demonstrate good judgment and exhibit a good public relations attitude at all times.

Even though transit police were not part of the inspector department, they worked closely with inspectors to apprehend fare evaders. The transit police added six policemen when TRI-MET implemented SSFC.

TRI-MET recommended that systems implementing SSFC have an adequate number of managers and supervisors in the Fare Inspection Department. For the first nine months of SSFC, the manager of fare inspection had 60 inspectors and no assistant supervisory personnel. The demands of daily operations prevented the manager from (1) evaluating procedures and staff performance and (2) making changes to procedures and staff.

6.7.1 Inspection Districts

TRI-MET divided its service area into 29 inspection districts. Ridership, bus frequency, number of bus lines, projected evasion levels, and response time of transit police were used as bases for the inspection districts. As shown in Figure 6-2 (a map of TRI-MET's inspection districts), outlying districts with less service were larger than inner districts with more bus service. TRI-MET designed each district so that transit police in the district could respond in less than four minutes.

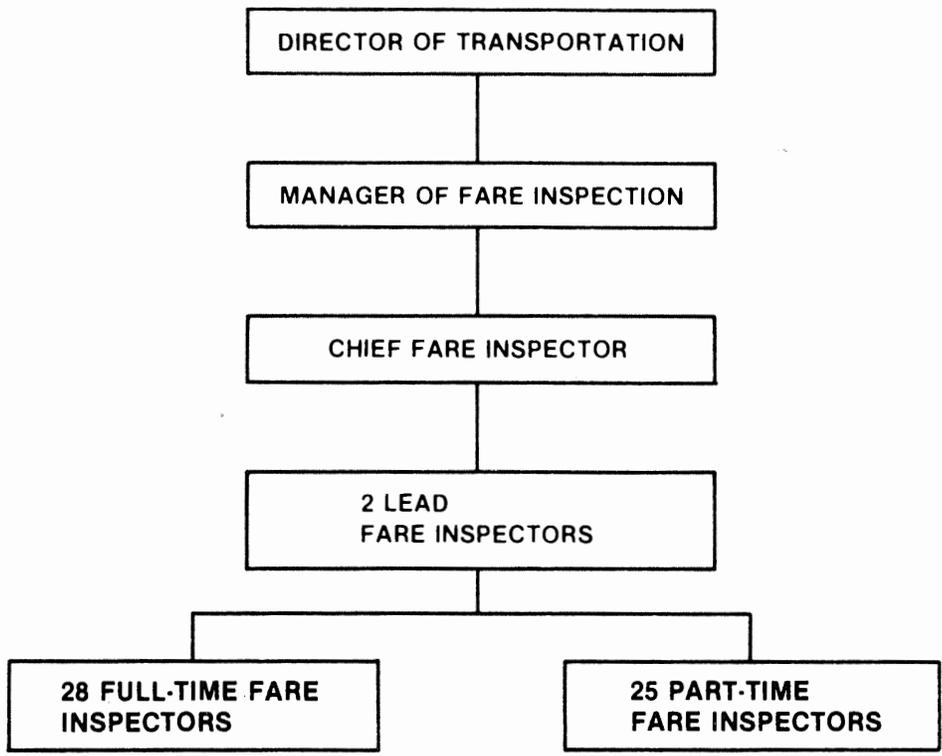


FIGURE 6-1. ORGANIZATION OF TRI-MET FARE INSPECTION DEPARTMENT

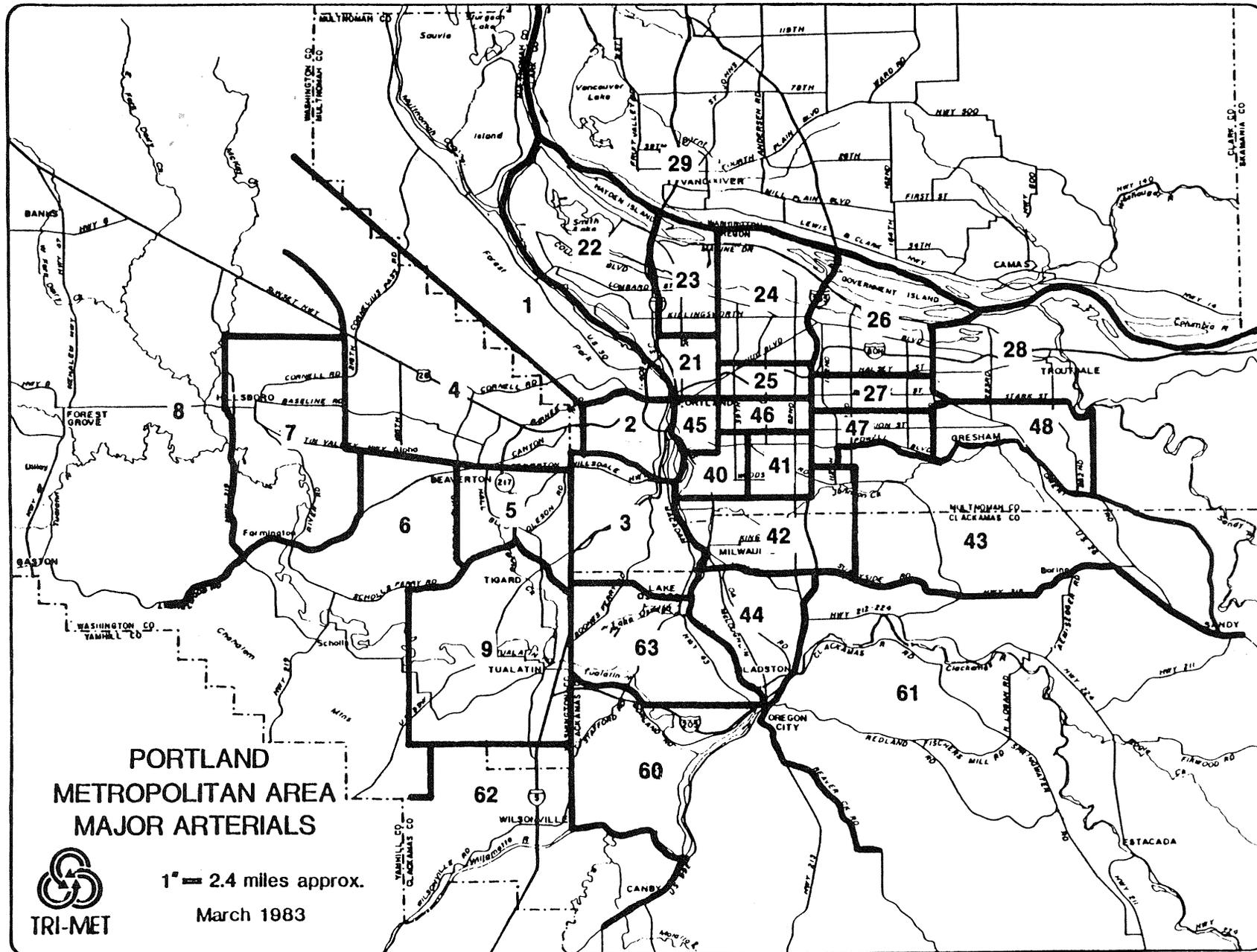


FIGURE 6-2. TRI-MET INSPECTION DISTRICTS

TRI-MET inspected each district at least once a month. It concentrated inspection efforts in districts with high ridership and high evasion rates.

6.7.2 Inspection Schedule

TRI-MET scheduled inspectors as follows:

- . 8 for the morning peak;
- . 16 for the midday;
- . 16 for the evening peak; and
- . 8 for the early evening.

TRI-MET did not schedule regular inspections for after 10 p.m. Ridership at that time was too light and scattered for inspection to be cost-effective. TRI-MET conducted late-hour (owl) inspections at the request of drivers. Drivers filled cards out to request inspections. The Inspection Department tried to respond to requests within a week.

TRI-MET scheduled inspector teams to operate in one district for half a shift and in another district for the other half. In this way, system coverage was expanded, and observable inspection patterns were prevented from developing. TRI-MET scheduled teams in a mix of high- and low-evasion districts to balance inspector's workloads.

6.7.3 Inspector Logs

Inspectors kept a log of their enforcement activities. For each violation, the log, presented in Figure 6-3, detailed:

- . whether a surcharge or warning was issued;
- . number, name, and direction of route;
- . time of day;
- . number of riders on the bus;
- . number of bus; and
- . type of violation.

TRI-MET used the logs as a source of data for its records, billing, and collection system.

FARE INSPECTION DAILY LOG

Date _____ Team _____ Inspector No. _____

F.I. Name(s) _____

Type C/W	Line/Train/Dist	Dir I-O	Time 24 Hr.	Total Riders	Bus No.	Type of Warning E Z N S C J
1	___/___/___	___	___	___	___	___
2	___/___/___	___	___	___	___	___
3	___/___/___	___	___	___	___	___
4	___/___/___	___	___	___	___	___
5	___/___/___	___	___	___	___	___
6	___/___/___	___	___	___	___	___
7	___/___/___	___	___	___	___	___
8	___/___/___	___	___	___	___	___
9	___/___/___	___	___	___	___	___
10	___/___/___	___	___	___	___	___
11	___/___/___	___	___	___	___	___
12	___/___/___	___	___	___	___	___
13	___/___/___	___	___	___	___	___
14	___/___/___	___	___	___	___	___
15	___/___/___	___	___	___	___	___
16	___/___/___	___	___	___	___	___
17	___/___/___	___	___	___	___	___
18	___/___/___	___	___	___	___	___
19	___/___/___	___	___	___	___	___
20	___/___/___	___	___	___	___	___
21	___/___/___	___	___	___	___	___
22	___/___/___	___	___	___	___	___
23	___/___/___	___	___	___	___	___
24	___/___/___	___	___	___	___	___
25	___/___/___	___	___	___	___	___

Totals: Riders _____ Surcharges _____ Warnings _____

FIGURE 6-3. FARE INSPECTION DAILY LOG

6.7.4 Surcharge Notice

TRI-MET designed the surcharge notice to look like a parking or speeding ticket (Figure 6-4). It thought that passengers' familiarity with this format would help them understand the notices more easily.

6.8 SURCHARGE COLLECTION

After receiving a notice, the passenger could pay the surcharge fare immediately or could mail the surcharge fare to TRI-MET within 20 days. Passengers who wished to pay the surcharge immediately were escorted by inspectors to the fare box to deposit \$20. Inspectors then issued the passengers a receipt. Few evaders paid their surcharge immediately. Those choosing to pay by mail received an envelope with the notice.

After 20 days, if the surcharge was not paid, TRI-MET levied a late fee of \$10 and sent a notice to the fare evader. Late fees accrued until a total of seven notices were sent and a surcharge of \$60 was reached, at which point the account was referred to a collection agency. The collection agency received 40 percent of the amount collected if TRI-MET provided a good address and 50 percent if it provided a bad address. The cycle from surcharge issuance to collection agency turnover lasted 54 days.

The collection agency, with TRI-MET's approval, referred uncollectable accounts to small claims court if the fare evader had any assets. The assets of fare evaders were used as criteria so that resources were only expended on accounts that they were likely to collect. TRI-MET did not want to "throw good money after bad." TRI-MET found small claims court most effective in collecting surcharges from parents of juveniles who evaded fares.

TRI-MET recommended that transit systems implementing SSFC use a short collection cycle. It found that long collection cycles made it difficult to collect delinquent accounts. TRI-MET shortened its collection cycle from 132 to 112 days and then to 54 days.

6.8.1 Records, Billing, and Collection System

TRI-MET did not have the staff or computer resources to develop an extensive records, billing, and collection system for fare surcharges. Therefore TRI-MET contracted with a local

		\$20 NOTICE & DEMAND FOR SURCHARGE FARE		269151	
PLEASE REMIT \$20 SURCHARGE WITHIN 20 DAYS TO AVOID LATE CHARGES				TEAM	INSP.
LINE	TRAIN	DIST.	DIR.	DATE (MM/DD/YY)	TIME (24 HOUR)
NAME (LAST)		NAME (FIRST)		NAME (M.I.)	
ADDRESS STREET ADDRESS		ADDRESS APT.			
ADDRESS CITY		ADDRESS STATE		ADDRESS ZIP	
DRIVER'S LICENSE		STATE	ID OBSERVED	S.S.N.	
TELEPHONE		SEX	DATE OF BIRTH (MM/DD/YY)		
ADDITIONAL I.D. (25 CHAR. MAX.)				10-200	
TYPE OF VIOLATION		TYPE FARE		TYPE RIDER	
N - NO POP SHOWN		C - CASH RECEIPT		A - ADULT	
E - EXPIRED TIME		P - PASS		H - HONORED CITIZEN	
Z - ZONE VIOLATION		M - VALIDATION TICKET		Y - YOUTH	
S - SPECIAL FARE VIOLATION		X - X TICKET		E - EMPLOYEE	
C - COUNTERFEIT PASS OR TICKET		O - OTHER		O - OTHER	
ZONES VALID	TIME EXPIRED	LOCATION OF VIOLATION (NEAREST INTERSECTION)			
SIGNATURE OF INSPECTOR			SIGNATURE OF PASSENGER		
TRI-MET IS A NON-PROFIT, PUBLIC CORPORATION SUPPORTED BY TAX-PAYER DOLLARS AND FAREBOX REVENUES. FARE EVASION COSTS US ALL.					
DESCRIPTION		COMMENTS:			
S/R					
HT					
WT					
H/E					
OTHER:					

ORIGINAL

FIGURE 6-4. FARE SURCHARGE NOTICE

company to develop, operate, and manage such a system. Main features of the system were:

- . Daily record updates comprising the entry of surcharges, inspector logs, receipts, and returned billings; calculation of late fees for open notices; balancing of receipts; clearance of uncollectable accounts; and depositing of receipts.
- . Computerized billing featuring computer calculation of late fees, selection of bill text, pre-sorting of mail, and determination of when bills should be mailed to qualify for pre-sorted first-class discounts.
- . Report generation providing reports on fare evasion by district and line, surcharge entries, late fee assessments, billings, receipts, write-offs, missing surcharge notices, surcharge entity changes, repeat violators, and surcharges eligible for collection.
- . Special features including on-line inquiry, surcharge flagging for special handling, undeliverable billings address correction, special report generation, data tape generation, and, for when TRI-MET gave written warnings, written warning conversion to surcharges.

TRI-MET was satisfied with the operation of the records, billings, and collection system.

6.8.2 Appeals

To have surcharges reviewed, riders sent TRI-MET \$20, along with written explanations of the circumstances of surcharge issuance and why they thought the surcharge was unwarranted. An appeals administrator reviewed appeals. The two most common reasons for appeal were that (1) the rider did not understand fare policy or (2) the rider forgot or lost the proof of payment. The committee accepted neither reason as legitimate for upholding an appeal. The administrator upheld appeals only for reasons of faulty equipment, inability to understand English, mental incompetency, and non-residency. Special appeals not covered by these guidelines were referred to an appeals committee or to the chairman of the committee. The committee was composed of representatives from each of the following TRI-MET departments: Operations, Planning, Marketing, and Public Affairs.

Initially, the committee reviewed all appeals. When the committee found that appeals were fairly routine, it established appeal guidelines and an appeals administrator to review appeals.

As of March 1984, appeals averaged 5.8 percent of surcharge notices (62 a week). Of these, TRI-MET upheld 17.3 percent.

The appeals process required considerable administrative effort. In addition to a full-time appeals administrator, TRI-MET estimated that it required 75 percent of a secretary's time and the full-time equivalent of 1.2 customer service representatives.

An issue that must be decided by systems wanting to implement SSFC is whether or not to have an appeals process. Legally, TRI-MET was not required to have an appeals process; the court ruled that small claims court hearings constituted due process. TRI-MET had the internal appeals process for public relations and for screening flagrant situations. Even if a system decides not to institute an appeals process, TRI-MET cautions that handling mail and calls concerning fare surcharges would still require substantial effort.

6.9 COLLECTION EXPERIENCE

TRI-MET has had difficulty collecting surcharge notices. As of May 1, 1984, the percentage of surcharges collected from April through October 1983 was 27 percent. As shown in Figure 6-5, most paid by the third bill.

From September 1982 through February 1984, collections totaled \$392,533. If all surcharges had been paid at the average payment of \$28.78, collections for the period would have totaled \$2,082,780.

TRI-MET efforts to increase collections had limited success:

- . Of the approximately 30 percent of surcharges turned over to the collection agency, only 1 out of 20 were collected. TRI-MET said the small size of the surcharges did not make it worthwhile for the collection agency to pursue the accounts aggressively. The first collection agency TRI-MET used cancelled its contract with TRI-MET because the accounts were too small.
- . The percentage of undeliverable mail fluctuated between 20 and 30 percent of billings after TRI-MET implemented the use of the reverse mail directory. (Undelivered mail formerly averaged between 30 and 40 percent of billings.)
- . To improve collections, TRI-MET twice reduced the collection cycle (the time between when a surcharge was issued and when it was referred to a collection agency).

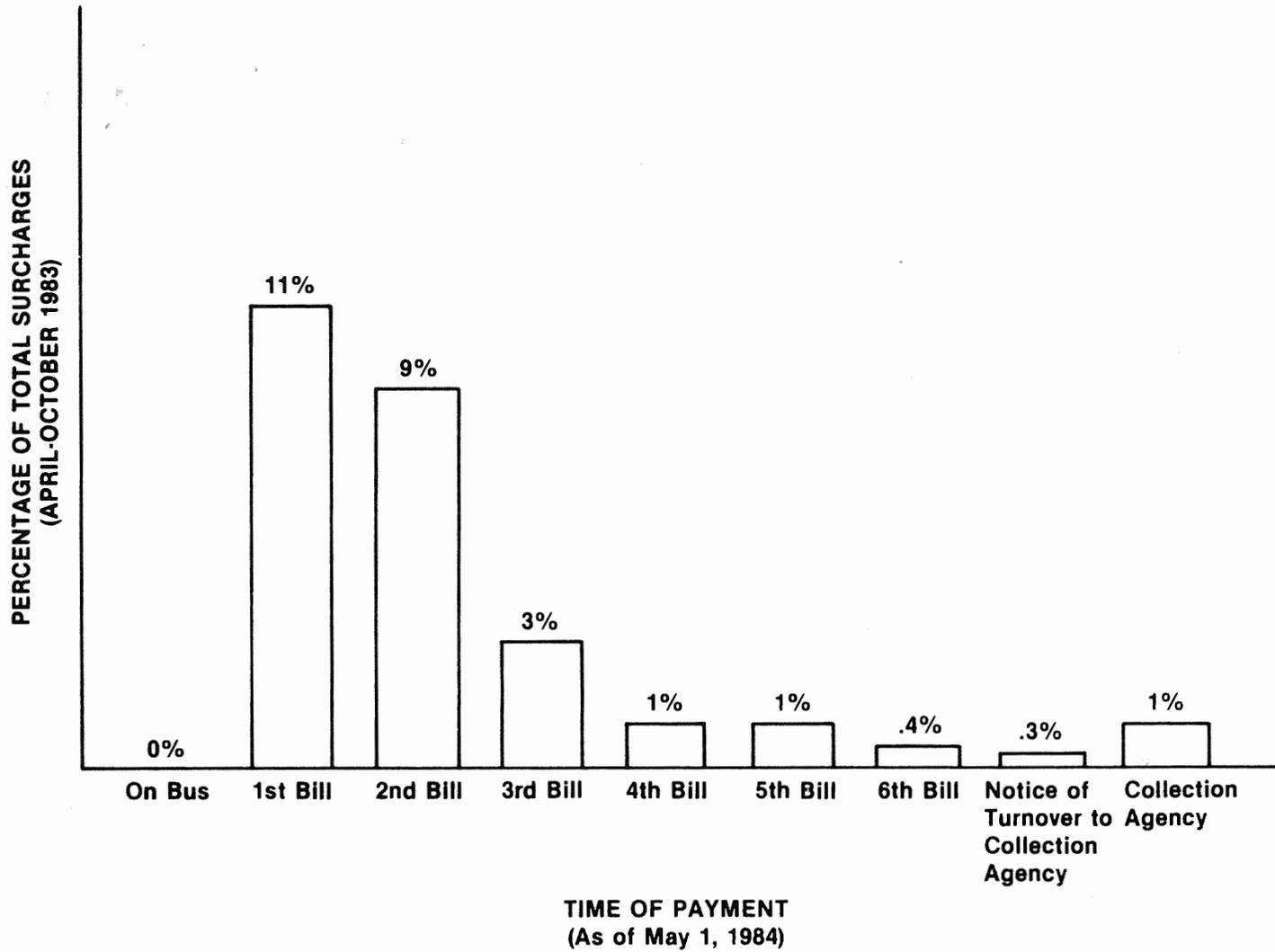


FIGURE 6-5. TIMELINESS OF SURCHARGE COLLECTIONS

- . TRI-MET won judgments against all evaders it took to small claims court. However, from September 1982 through April 1984, only approximately 100 cases out of 54,903 uncollected surcharges were taken to court. TRI-MET only took evaders to small claims court if they had any assets. Most of the evaders with outstanding surcharges had no assets.
- . TRI-MET began issuing citations in November 1983. The collection rate of citations issued from that time to May 1985 was 91 percent. However, while 22,152 surcharges were issued, only 240 citations were issued during that period.

The ease with which fare evaders avoided paying surcharge fares undermined TRI-MET enforcement efforts.

7. OPERATIONS EFFECTS OF SSFC

TRI-MET anticipated that all-doors boarding, made possible by SSFC, would result in shorter bus dwell times, and that these shorter dwell times would affect articulated buses more than other buses. (Without SSFC, TRI-MET expected the introduction of articulated buses to slow transit operations because the passenger volume of articulated buses is high.) The time savings from shorter dwell times would decrease bus travel time, particularly on the Downtown Transit Mall, where dwell times make up a larger share of bus run time than in other locations. If the time savings were large enough, TRI-MET could operate bus routes with fewer vehicles, thereby resulting in major cost savings. The expectation of cost savings was a major justification for implementing SSFC.

To evaluate how SSFC and articulated buses affected bus operations, TRI-MET conducted three separate data collection surveys:

- . bus stop dwell time surveys;
- . Downtown Transit Mall run time surveys; and
- . route dwell time surveys.

A discussion of the surveys is presented in Appendix D.

7.1 BUS STOP DWELL TIME SURVEYS

To identify the effects of SSFC and articulated buses on dwell times, TRI-MET conducted surveys at the following times:

- . spring 1981, before SSFC and before the introduction of articulated buses;
- . spring 1982, before SSFC but after the introduction of articulated buses; and
- . spring 1983, during SSFC.

The surveys were conducted at selected bus stops with high levels of passenger activity. These bus stops were classified into four groups, according to location:

- . on-mall (located on the Downtown Transit Mall);
- . cross-mall (located downtown and adjacent to the Transit Mall);
- . transfer points; and

. shopping centers.

The spring 1981 surveys included on-mall and cross-mall bus stops only.

Observers were stationed at each bus stop. These observers recorded information for each bus, including length of dwell time, number of boarding passengers, and number of alighting passengers.

7.1.1 Dwell Time

Since bus stop dwell time depends on the number of passengers boarding and alighting during each dwell, average dwell time per boarding and alighting passenger is computed for each subset of observations. The average dwell time per boarding and alighting passenger generally increases as the number of boarding and alighting passengers decreases. The average dwell time per boarding and alighting passenger was the same for both the 1981 and the 1982 periods. Note that articulated buses accounted for only 11 percent of the spring 1982 observations and that the addition of articulated buses did not significantly affect average dwell time.

7.1.2 Effects of Articulated Buses

The average dwell time and the average number of boarding and alighting passengers per bus stop at downtown locations for the spring 1981 and the spring 1982 observation periods are summarized in Table 7-1. This table shows that adding articulated buses to the bus fleet before SSFC did not effect average downtown dwell times.

A typical dwell comprises:

- . a fixed portion before the first passenger movement and after the last passenger movement; and
- . a variable portion that is related to the total number of passenger movements.

Average dwell times for standard and articulated buses during the spring 1982 period (before SSFC) are compared in Table 7-2. These comparisons show that:

- . For all observations, average bus dwell time per boarding and alighting passenger was slightly greater for articulated buses; however, this result was affected by the lower observed volumes of boarding and alighting passengers on articulated buses.

TABLE 7-1

DOWNTOWN DWELL TIMES BEFORE SSFC

<u>Bus Type</u>	<u>Bus Stop Location</u>	<u>Average Dwell Time Per Stop (Seconds)</u>	<u>Average Number of Boarding & Alighting Passengers Per Stop</u>	<u>Dwell Time Per Boarding & Alighting Passenger (Seconds)</u>
Spring 1981 (Standard Buses Only)	On-Mall	20.7	7.9	2.6
	Cross-Mall	<u>31.1</u>	<u>11.7</u>	<u>2.7</u>
	Downtown Observations	23.3	8.9	2.6
Spring 1982 (Standard and Articulated Buses)	On-Mall	21.6	7.6	2.8
	Cross-Mall	<u>42.2</u>	<u>17.8</u>	<u>2.4</u>
	Downtown Observations	28.0	10.8	2.6

TABLE 7-2

DWELL TIMES BY BUS TYPE BEFORE SSFC (SPRING 1982)

<u>Bus Type</u>	<u>Bus Stop Location</u>	<u>Average Dwell Time Per Stop (Seconds)</u>	<u>Average Number of Boarding & Alighting Passengers Per Stop</u>	<u>Dwell Time Per Boarding & Alighting Passenger (Seconds)</u>
Standard	On-Mall	20.8	7.4	2.8
	Cross-Mall	42.5	17.9	2.4
	Transfer Points	12.0	3.7	3.3
	Shopping Centers	<u>19.5</u>	<u>5.5</u>	<u>3.5</u>
	All Locations	23.8	8.9	2.7
Articulated	On-Mall	26.0	8.9	2.9
	Cross-Mall	7.0	2.0	3.5
	Transfer Points	17.5	7.7	2.3
	Shopping Centers	<u>30.5</u>	<u>4.5</u>	<u>6.8</u>
	All Locations	23.7	8.3	2.8

- . For the on-mall observations, average bus dwell time per boarding and alighting passenger was higher for articulated buses despite their higher volume. This higher volume could be a result of articulated buses being used only on the most heavily patronized routes where congestion within the vehicle can affect dwell times.

Conclusions cannot be drawn for the other subsets of observations in Table 7-2 because the number of observations recorded for articulated buses was low.

7.1.3 Effects of SSFC

The introduction of SSFC did not affect bus dwell times. Table 7-3 compares dwell times for the spring 1982 (pre-SSFC) and spring 1983 (SSFC) periods. Although average dwell time per boarding and alighting passenger for all observations increased slightly, this result was affected by the average number of boarding and alighting passengers per bus stop, which declined. Average dwell time per bus stop declined as well.

SSFC caused some changes, however. Regression equations were derived for the two observation periods with dwell time per bus stop as the dependent variable and passenger boardings (ons) and alightings (offs) as independent variables. These equations for spring 1982 and spring 1983 are:

- . spring 1982 (pre-SSFC):

$$\text{dwell} = 5.95 + 1.18 (\text{offs}) + 2.46 (\text{ons}); R^2 = 0.82$$

(.064) (.052)

- . spring 1983 (SSFC):

$$\text{dwell} = 8.26 + 1.58 (\text{offs}) + 1.93 (\text{ons}); R^2 = 0.66$$

(.064) (.052)

The figures in parentheses indicate the standard errors for the regression coefficients.

The lower coefficient for the SSFC ons variable as compared with the coefficient for the pre-SSFC ons variable suggests quicker passenger boardings. This change was an expected benefit of SSFC, and was probably caused by all-doors boarding and the reduction in the proportion of cash fare payments from 38 percent to 34 percent during SSFC. The two coefficients are statistically different at the 99 percent significance level.

The coefficient of the offs variable, as well as the constant term, increased under SSFC, suggesting a less efficient operation. The coefficients of the offs variable are also

TABLE 7-3

DWELL TIMES BEFORE AND DURING SSFC*

<u>Bus Type</u>	<u>Bus Stop Location</u>	<u>Average Dwell Time Per Stop (Seconds)</u>	<u>Average Number of Boarding & Alighting Passengers Per Stop</u>	<u>Dwell Time Per Boarding & Alighting Passenger (Seconds)</u>
Pre-SSFC (Spring 1982)	On-Mall	21.6	7.6	2.8
	Cross-Mall	42.2	17.8	2.4
	Transfer Points	12.6	4.1	3.1
	Shopping Centers	<u>20.1</u>	<u>5.5</u>	<u>3.7</u>
	All Locations	23.8	8.8	2.7
SSFC (Spring 1983)	On-Mall	23.2	8.2	2.8
	Cross-Mall	41.4	16.7	2.5
	Transfer Points	11.6	4.1	2.9
	Shopping Centers	<u>26.1</u>	<u>7.5</u>	<u>3.5</u>
	All Locations	22.5	8.2	2.8

*Standard and Articulated Buses

statistically different at the 99 percent significance level. These increases may have been caused by a greater number of conflicts between boarding and alighting passengers under SSFC.

Before SSFC, 59 percent of alighting passengers used the front door of a bus and 41 percent used the rear door. All boarding passengers during this period used the front door. Therefore, passengers alighting at the rear door experienced no impedance.

During SSFC, the proportions of alighting passengers at the doors were about the same as before SSFC. However, the distribution of boarding passengers changed from 100 percent at the front door before SSFC to 59 percent at the front and 41 percent at the rear during SSFC. (The similarity of the proportions for boarding passengers and alighting passengers is coincidental.) This distribution led to more direct conflicts between boarding and alighting passengers, as both groups approached each door simultaneously. The congestion caused by such conflicts may have resulted in longer alighting times.

Dwell times for spring 1982 (before SSFC) and spring 1983 (during SSFC) are summarized for standard buses in Table 7-4, and for articulated buses in Table 7-5. The results are similar to the results discussed above. Average dwell time per boarding and alighting passenger for all observations was similar during both periods for each bus type.

Regression equations were derived for the two bus types for each period. These equations, which reflect the same effects discussed for the general case, are:

- . standard buses - spring 1982 (pre-SSFC):

$$\text{dwell} = 5.56 + 1.22 (\text{offs}) + 2.49 (\text{ons}); R^2 = 0.84$$

(.066) (.053)

- . standard buses - spring 1983 (SSFC):

$$\text{dwell} = 7.95 + 1.61 (\text{offs}) + 1.95 (\text{ons}); R^2 = 0.67$$

(.069) (.071)

- . articulated buses - spring 1982 (pre-SSFC):

$$\text{dwell} = 10.51 + 0.70 (\text{offs}) + 2.00 (\text{ons}); R^2 = 0.62$$

(.231) (.209)

- . articulated buses - spring 1983 (SSFC):

$$\text{dwell} = 11.52 + 1.30 (\text{offs}) + 1.60 (\text{ons}); R^2 = 0.47$$

(.171) (.202)

TABLE 7-4

DWELL TIMES OF STANDARD BUSES BEFORE AND DURING SSFC

<u>Phase</u>	<u>Bus Stop Location</u>	<u>Average Dwell Time Per Stop (Seconds)</u>	<u>Average Number of Boarding & Alighting Passengers Per Stop</u>	<u>Dwell Time Per Boarding & Alighting Passenger (Seconds)</u>
Pre-SSFC (Spring 1982)	On-Mall	20.8	7.4	2.8
	Cross-Mall	42.5	17.9	2.4
	Transfer Points	12.0	3.7	3.3
	Shopping Centers	<u>19.5</u>	<u>5.5</u>	<u>3.5</u>
	All Locations	23.8	8.9	2.7
SSFC (Spring 1983)	On-Mall	22.3	7.7	2.9
	Cross-Mall	41.1	16.7	2.5
	Transfer Points	10.7	3.8	2.8
	Shopping Centers	<u>26.6</u>	<u>7.9</u>	<u>3.4</u>
	All Locations	22.4	8.2	2.7

TABLE 7-5

DWELL TIMES OF ARTICULATED BUSES BEFORE AND DURING SSFC

<u>Phase</u>	<u>Bus Stop Location</u>	<u>Average Dwell Time Per Stop (Seconds)</u>	<u>Average Number of Boarding & Alighting Passengers Per Stop</u>	<u>Dwell Time Per Boarding & Alighting Passenger (Seconds)</u>
Pre-SSFC (Spring 1982)	On-Mall	26.0	8.9	2.9
	Cross-Mall	7.0	2.0	3.5
	Transfer Points	17.5	7.7	2.3
	Shopping Centers	<u>30.5</u>	<u>4.5</u>	<u>6.8</u>
	All Locations	23.7	8.3	2.8
SSFC (Spring 1983)	On-Mall	26.7	9.8	2.7
	Cross-Mall	-	No Cases	-
	Transfer Points	17.4	5.8	3.0
	Shopping Centers	<u>20.3</u>	<u>3.0</u>	<u>6.8</u>
	All Locations	23.5	8.3	2.8

The corresponding coefficients in the equations for standard buses are statistically different at the 99 percent significance level; the significance levels for the articulated bus equations are both greater than 90 percent. However, the ability of the equations to fit the observed data, as measured by the R^2 metric, is lower for the SSFC cases than for the pre-SSFC cases. This finding suggests that dwell times during SSFC were influenced by other factors than just boarding and alighting volumes. These factors may include unreliability of SSFC equipment and unfamiliarity of some passengers with using SSFC equipment.

7.2 TRANSIT MALL RUN TIME SURVEYS

TRI-MET conducted transit mall run time surveys to determine:

- . if standard and articulated buses have different run times; and
- . if run times changed with the introduction of SSFC.

During the midday and evening peak periods, observers stationed at each end of the transit mall recorded information for each bus. Such information included arrival time, bus number, and route number. During the peak period when bus traffic was heavy, some buses were not included.

Average bus travel speeds along the mall were calculated for each of the three survey periods. Table 7-6 presents these results.

Bus travel speeds on the mall were consistently slower during the evening peak period than during the midday period. This fact reflects (1) the higher bus traffic on the mall during peak periods, resulting in more traffic congestion, and (2) the higher volumes of boarding and alighting passengers during peak periods, resulting in longer dwell times.

7.2.1 Effects of Articulated Buses

After articulated buses were introduced (spring 1982), bus speeds on the mall increased slightly, despite increased bus traffic on the mall and longer average dwell times for on-mall bus stops (20.7 seconds before SSFC versus 21.6 seconds during SSFC).*

During the midday peak period, articulated buses had slightly lower average speeds than had standard buses, but during the evening peak period, articulated buses had higher average speeds. Average dwell times per bus stop, however, were consistently longer for articulated buses, as shown below.

TABLE 7-6

AVERAGE BUS TRAVEL SPEED
(Miles Per Hour)

	<u>Spring 1981 Standard Buses Only</u>	<u>Spring 1982 With Articulated Buses</u>	<u>Spring 1983 (SSFC)</u>
Standard Buses - Day	5.39	5.61	5.22
Standard Buses - Evening Peak	4.65	4.84	4.61
Articulated Buses - Day	-	5.50	5.10
Articulated Buses - Evening Peak	-	5.36	4.75
All Buses - Day	5.39	5.60	5.20
All Buses - Evening Peak	4.65	4.92	4.64

AVERAGE DWELL TIME AT ON-MALL BUS STOPS (SPRING 1982)*

	<u>Midday</u>	<u>Evening Peak</u>
Standard Buses	20.5 sec.	21.6 sec.
Articulated Buses	25.6 sec.	27.8 sec.

*Source: Bus Stop Dwell Time Survey.

The longer average dwell time experienced by articulated buses ordinarily indicates lower average speeds for articulated buses than for standard buses. However, since lower average speeds did not materialize for articulated buses during the evening peak period, factors other than the difference in dwell times must have caused the differences in speed.

7.2.2 Effects of SSFC

During SSFC (spring 1983), bus speeds on the transit mall decreased. This result was contrary to expectations; however, it reflects the higher average dwell time per bus stop for on-mall observations shown in Table 7-3.

7.3 ROUTE DWELL TIME SURVEYS

TRI-MET conducted route dwell time surveys to determine if total dwell time along a route changed as a result of SSFC.

From experience in Europe, TRI-MET hypothesized that if significant dwell time (and therefore travel time) savings could be realized with SSFC, then operating efficiencies allowing the operation of bus routes with fewer vehicles would result.

Surveys were conducted at two times:

- . spring 1982 (before SSFC); and
- . spring 1983 (during SSFC).

Observers riding in buses on selected routes collected data on boarding passengers, alighting passengers, and dwell times at each bus stop along a route. Surveys were not conducted on routes using articulated buses.

The number of vehicles needed to operate a bus route is related to the scheduled service headway and the time necessary for each vehicle to make a round-trip run, including any layover

time. If SSFC operation resulted in this round-trip time being reduced, then the number of vehicles on the route could feasibly be reduced. Generally, if round-trip time savings equal to one headway can be realized, then one vehicle can be removed from the route.

TRI-MET anticipated that the introduction of SSFC would result in some travel time savings. The route dwell time surveys were conducted to quantify the size of these savings.

The bus stop observations were aggregated by one-way trip. Peak period trips were then analyzed, as any operating efficiencies resulting from SSFC would be realized when service headways are the shortest.

For the spring 1982 period (pre-SSFC), average dwell time per one-way trip was 134.2 seconds for a morning peak bus and 136.4 seconds for an evening peak bus. Total dwell time ranged from a low of 38 seconds for an outbound morning peak bus to a high of 297 seconds for an inbound morning peak bus. The bus routes that were surveyed had round trip times ranging from 50 to 110 minutes.

Dwell time savings approaching one headway could probably not be realized on any route because:

- . Average route dwell times were shorter than TRI-MET's shortest headways.
- . Only the variable portions of dwell times can be reduced.

As indicated in Table 7-7, dwell time savings were not realized with SSFC, as the average dwell time per one-way trip actually increased for both peak periods. Some of this increase for the evening peak can be explained by an increase in boarding and alighting passengers; however, average dwell per boarding and alighting passenger increased dramatically for both periods.

The increase in average dwell per boarding and alighting passenger found in the route dwell time surveys was not apparent from the bus stop dwell time surveys. The bus stop dwell time surveys showed that average dwell per boarding and alighting passenger at high activity bus stops was the same during SSFC as before SSFC. However, the route dwell time surveys included both high activity and low activity bus stops. For the bus stop dwell time surveys, the average number of boarding and alighting passengers per bus stop was 8.8 before SSFC and 8.2 during SSFC; for the route dwell time surveys, the average number for peak period runs was 2.9 before SSFC and 2.6 during SSFC, indicating

TABLE 7-7

LINE DWELL TIMES BEFORE AND DURING SSFC

<u>Fare Collection</u>	<u>Time and Direction of Bus Trips</u>	<u>Average Dwell Time Per Trip (Seconds)</u>	<u>Average Number of Boarding and Alighting Passengers Per Trip</u>	<u>Average Dwell Per Boarding and Alighting Passenger (Seconds)</u>
Pre-SSFC (Spring 1982)	A.M. Peak-Inbound	175.3	61.0	2.9
	A.M. Peak-Outbound	<u>102.2</u>	<u>37.1</u>	<u>2.8</u>
	All A.M. Peak	134.2	47.6	2.8
	P.M. Peak-Inbound	105.3	35.0	3.0
	P.M. Peak-Outbound	<u>165.1</u>	<u>56.4</u>	<u>2.9</u>
	All P.M. Peak	136.4	46.8	3.0
	SSFC* (Spring 1983)	A.M. Peak-Inbound	223.9	47.3
A.M. Peak-Outbound		<u>174.5</u>	<u>41.1</u>	<u>4.2</u>
All A.M. Peak		197.5	44.0	4.5
P.M. Peak-Inbound		188.2	42.9	4.4
P.M. Peak-Outbound		<u>316.2</u>	<u>90.4</u>	<u>3.5</u>
All P.M. Peak		254.7	67.6	3.8

*Standard and Advanced Design Buses

a large proportion of low-activity bus stops. Therefore, observed increases in dwell times may have resulted from effects of SSFC at low activity bus stops. These effects could not be quantified because the bus stop surveys did not include low activity bus stops.

TRI-MET suggested that some of the observed increase in average dwell time may have been caused by the introduction of advanced design buses which took place with the implementation of SSFC. TRI-MET speculated that ADB's narrower aisles increased front-door congestion. Although the number of peak period bus trips observed was not sufficient for drawing definite conclusions for comparing the vehicles, dwell times during SSFC were longer on runs using advanced design buses than for trips using standard buses (Table 7-8). However, the average dwell times for standard buses during SSFC were in turn longer than those before SSFC. Therefore, SSFC may have increased route dwell times.

Although the number of observations was small, pre-SSFC and SSFC route dwell times were also analyzed for specific bus routes. In all cases, average total dwell time per trip for peak period trips was higher during SSFC.

7.4 SUMMARY

The results of the TRI-MET surveys show that anticipated savings in dwell time and travel time did not materialize, and in some cases, negative effects were apparent. Regression analysis showed that, during SSFC, passenger boardings were quicker and passenger alightings were slower. The increased passenger alighting times offset savings in passenger boarding times.

TABLE 7-8

SSFC LINE DWELL TIMES BY BUS TYPE
(Spring 1983)

<u>Fare Collection</u>	<u>Time and Direction of Bus Trip</u>	<u>Average Dwell Time Per Trip (Seconds)</u>	<u>Average Number of Boarding and Alighting Passengers Per Trip</u>	<u>Average Dwell Per Boarding and Alighting Passenger (Seconds)</u>
Standard	A.M. Peak-Inbound	212.0	47.0	4.5
	A.M. Peak-Outbound	<u>130.0</u>	<u>35.0</u>	<u>3.7</u>
	All A.M. Peak	171.0	41.0	4.2
	P.M. Peak-Inbound	179.9	44.8	4.0
	P.M. Peak-Outbound	<u>310.4</u>	<u>90.5</u>	<u>3.4</u>
	All P.M. Peak	248.6	68.8	3.6
Advanced Design	A.M. Peak-Inbound	225.8	47.3	4.8
	A.M. Peak-Outbound	<u>180.9</u>	<u>42.0</u>	<u>4.3</u>
	All A.M. Peak	201.6	44.5	4.5
	P.M. Peak-Inbound	213.0	37.3	5.7
	P.M. Peak-Outbound	<u>335.3</u>	<u>90.0</u>	<u>3.7</u>
	All P.M. Peak	274.2	63.7	4.3

8. SSFC OPERATING COSTS

This section discusses the operating costs of SSFC and compares the operating costs of SSFC with those of traditional fare collection.

8.1 EQUIPMENT MAINTENANCE COSTS

TRI-MET estimated that annual costs for SSFC equipment maintenance were \$944,900. Annual costs for traditional fare collection averaged \$3,900. Table 8-1 presents the elements of the total annual costs.

The Road Supervision Department, which comprised 36 road supervisors and dispatchers, spent one-third of its time responding to SSFC equipment failures. TRI-MET did not hire additional road supervisors for SSFC and TRI-MET's Operations Department was concerned that road supervisors were unable to perform their regular duties because SSFC equipment demanded so much of their time.

Management information system costs are for the costs of tracking SSFC equipment location and repairs. Storage and inventory costs are the costs of spare parts and equipment. Manufacturer warranty and fare box repair costs are self-explanatory. Van operation costs are the annual operating and capital costs of the van used for repairing in-service SSFC equipment in downtown Portland.

The annual maintenance costs of \$317,200 represented 1.7 percent of TRI-MET's total Maintenance Department budget. Table 8-2 presents the breakdown of these costs.

J.W. Leas & Associates, in their audit of TRI-MET's SSFC equipment, stated that yearly total maintenance costs of \$820,100 (\$944,900 less manufacturer's warranty) showed that the fare collection equipment was unreliable. Maintaining SSFC equipment should not have exceeded \$400,000, approximately 15 percent of its purchase price. The 15 percent is the "rule of thumb" for this type of equipment.

8.2 ENFORCEMENT COSTS

TRI-MET's annual enforcement costs, comprising inspection; transit police; records, billing, and collection; and appeals administration, totaled \$1,659,600. Annual surcharge collections totaled \$329,600. Net annual operating costs totaled \$1,330,000. Table 8-3 provides a breakdown of these costs. Costs of bus operator time for fare enforcement are not included as operators had enforcement responsibilities under both fare collections systems in Portland.

TABLE 8-1

ANNUAL SSFC AND TRADITIONAL FARE COLLECTION
EQUIPMENT MAINTENANCE COSTS

<u>Cost</u>	<u>SSFC</u>	<u>Traditional Fare Collection</u>
Road Supervision Response	\$423,900	-
Management Information System	17,400	-
Storage and Inventory	50,500	-
Manufacturer's Warranty	124,800	-
Fare Box Repair	3,900	\$3,900
Van Operation	7,200	-
Maintenance	<u>317,200</u>	<u>-</u>
TOTAL	\$944,900	\$3,900

Source: TRI-MET.

TABLE 8-2

SSFC MAINTENANCE DEPARTMENT COSTS

<u>Maintenance Station</u>	<u>Staff</u>	<u>Weekly Hours</u>	<u>Weekly Cost</u>
Center	2 Day Mechanics	56	\$ 1,700
	2 Night Mechanics	10	
	Work Card/Road Call	31	
	Pull-Out Repairs	20	
	Servicing	<u>3</u>	
		110	
Merlo	2 Day Mechanics	48	\$ 1,400
	2 Night Mechanics	15	
	Work Card/Road Call	16	
	Pull-Out Repairs	10	
	Servicing	<u>3</u>	
		92	
Powell	2 Day Mechanic	65	\$ 1,000
	Work Card/Road Call	5	
	Pull-Out Repairs	7	
	Servicing	<u>2</u>	
		79	
Downtown Maintenance Van	1 Day Morning Mechanic	40	\$ 2,000
	1 Day Morning Helper	40	
	1 Day P.M. Mechanic	40	
	1 Day P.M. Helper	<u>40</u>	
		160	
Total Weekly Hours and Costs		<u>441</u>	<u>\$ 6,100</u>
Total Annual Costs			<u>\$317,200</u>

Source: TRI-MET.

TABLE 8-3

ITEMIZED ANNUAL SSFC ENFORCEMENT COSTS

<u>Department</u>	<u>Annual Costs</u>
Inspection	
Manager	\$ 42,500
Chief Inspector	31,900
2 Lead Inspectors	62,400
28 Full-time Inspectors	856,000
25 Part-time Inspectors	144,800
Secretarial Services	<u>19,400</u>
Subtotal	1,157,000
Transit Police	
6 Police Officers	182,300
Secretarial Services	<u>2,000</u>
Subtotal	184,300
Records, Billing & Collection	
Contracted Computer Service	218,200
Mail	7,300
Inspection and Collection Forms	7,600
Collection Agency Fees	<u>5,600</u>
Subtotal	238,700
Appeals Administration	
Manager	22,700
Secretarial Services (Equivalent of .75 Secretary)	10,000
Customer Service (Equivalent of 1.2 Customer Service Representatives)	26,400
Mailing Services	7,300
Miscellaneous	<u>13,200</u>
Subtotal	<u>79,600</u>
Total Annual SSFC Enforcement Costs	\$1,659,600
Annual Surcharge Collections	<u>(329,600)</u>
Total Net Costs	<u>\$1,330,000</u>

Source: TRI-MET.

8.3 FARE EVASION COSTS

TRI-MET estimated pre-SSFC fare evasion and associated revenue losses from a May 1982 fare compliance study. For the study, TRI-MET observed a random sample of bus trips using bus drivers and fare inspectors. TRI-MET estimated SSFC fare evasion revenue losses by comparing actual fare receipts to estimates of expected revenues calculated using ridership data from its May 1983 on-board ridership survey. TRI-MET did not conduct a fare compliance study during SSFC, so no accurate estimate of SSFC fare evasion exists. Data from fare inspector logs were not used for estimating evasion rates because inspectors were not deployed randomly and the presence of fare inspectors influenced fare evador behavior. Appendix E discusses the methodologies used to estimate fare evasion and revenue losses.

Fare evasion and associated revenue losses rose during SSFC. Fare evasion revenue losses more than doubled, rising to 8.9 percent from the pre-SSFC level of 4.1 percent (Figure 8-1). Annual fare evasion losses during SSFC totaled approximately \$1,692,000. Revenue losses at the pre-SSFC rate of 4.1 percent totaled approximately \$800,000.

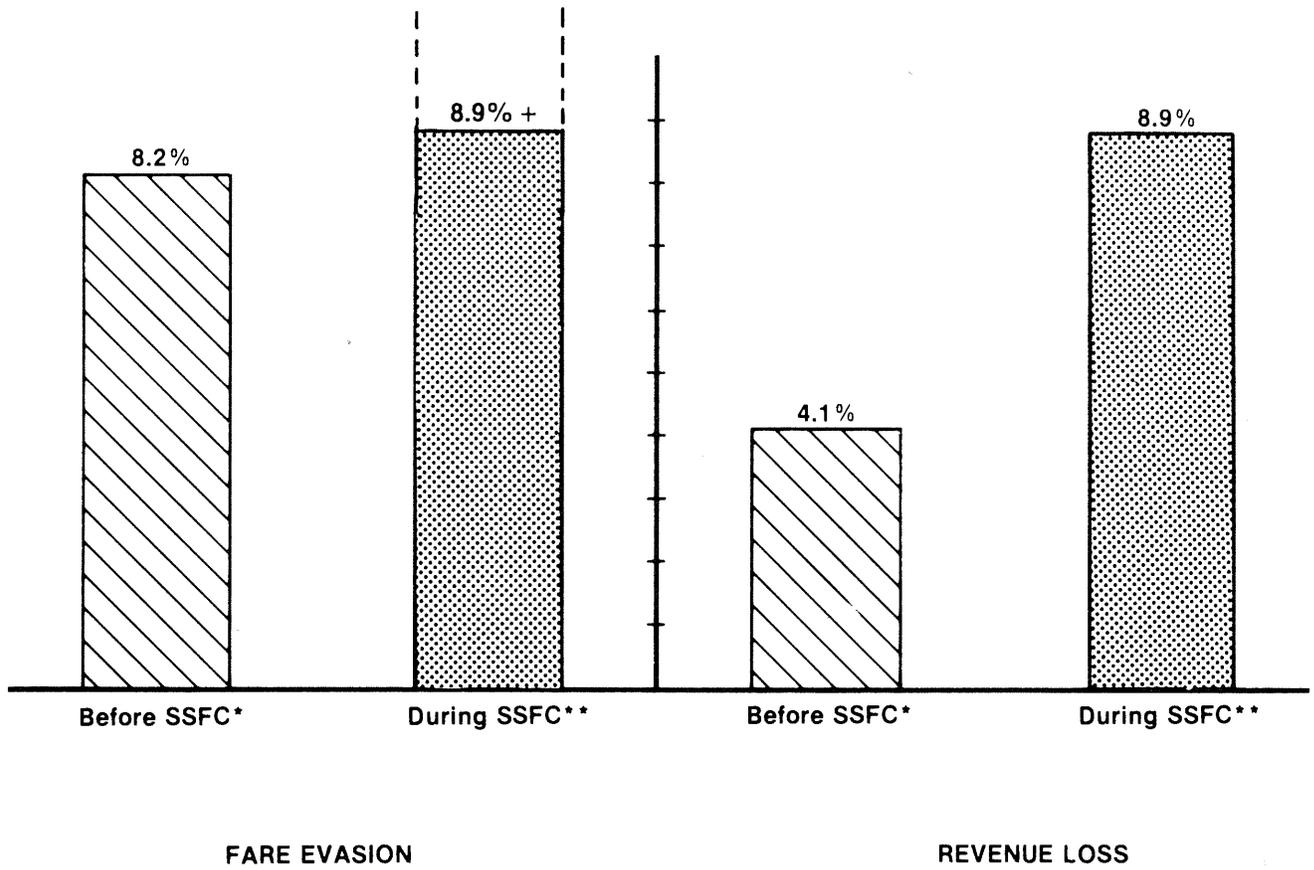
Fare evasion rose from the pre-SSFC level of 8.2 percent to a rate higher than 8.9 percent. Fare evasion during SSFC was higher than the revenue losses of 8.9 percent because some evaders paid some fare, such as those who shortchanged the farebox or evaded zone fares.

The types of fare evasion changed during SSFC. Before SSFC, the types of fare evasion that were the most difficult for operators to monitor were the most common. These included zone fare evasion, which accounted for 51 percent of evasions, and farebox shortchanging, which accounted for 29 percent of evasions. No payment accounted for only 3 percent of evasions. During SSFC, no payment accounted for 51 percent of evasions and farebox shortchanging accounted for 39 percent (Figure 8-2).

The prevalence of no payments during SSFC had serious effects on revenue. Before SSFC, most fare evaders paid a portion of the fare while during SSFC half the evaders paid nothing.

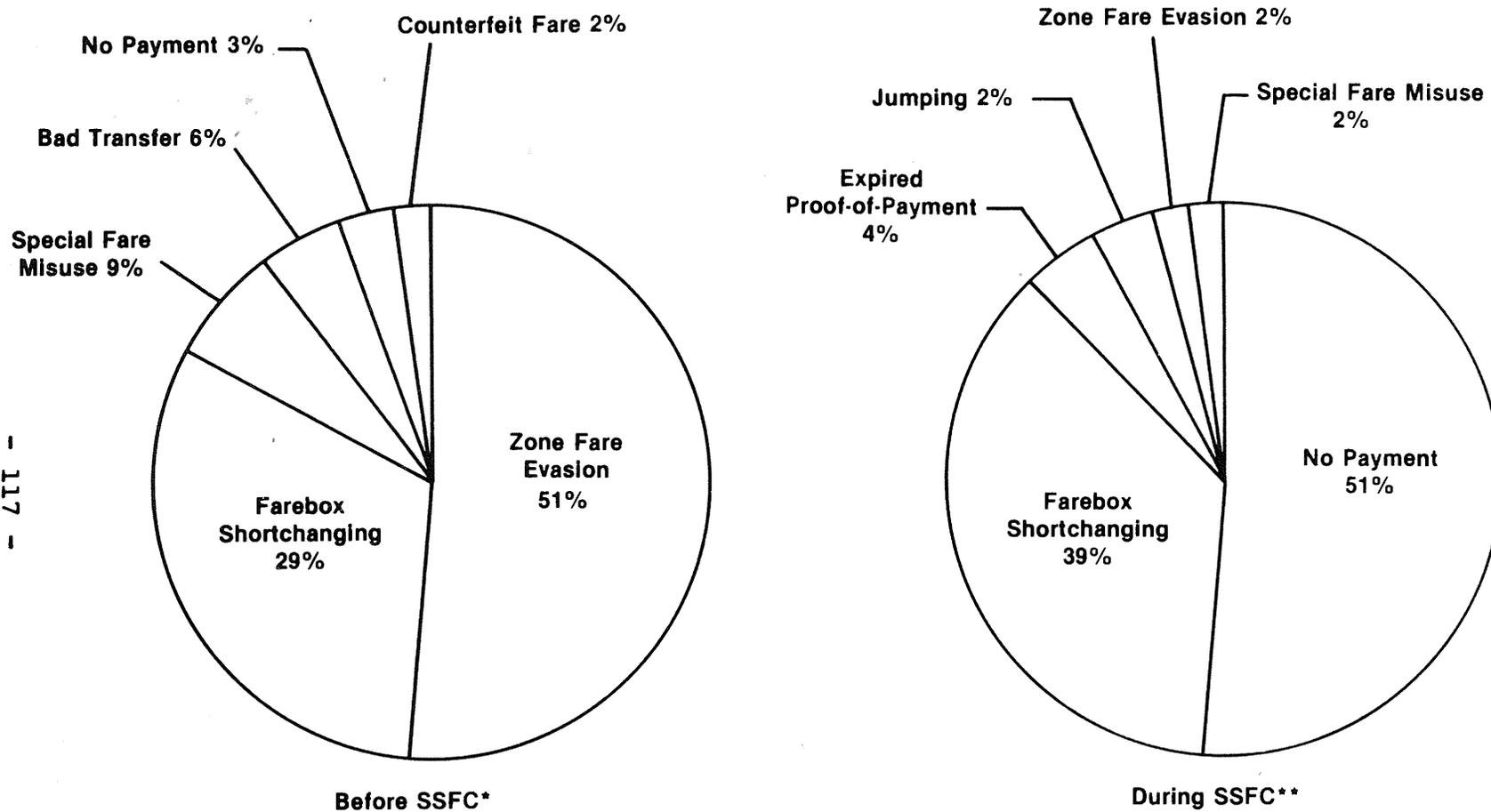
8.4 VANDALISM COSTS

Before SSFC, vandalism was not a problem on buses. During SSFC, vandalism on buses became a problem. TRI-MET experienced problems with graffiti, slashed seats, and fires in the backs of the buses. The problems with vandalism were most severe on articulated and advanced design buses because driver visibility of the back of these buses was poor. After TRI-MET instituted partial SSFC/partial driver monitoring, vandalism gradually declined but not to pre-SSFC levels.



* Source: TRI-MET PRE-SSFC Fare Compliance Study, May 1982.
 ** Source: TRI-MET Annual Ridership Survey, May 1983.

FIGURE 8-1. BEFORE AND DURING SSFC FARE EVASION AND REVENUE LOSS



* Source: TRI-MET Pre-SSFC Fare Compliance Study, May 1982.

** Sources: TRI-MET Fare Inspector Logs and TRI-MET Farebox Shortchanging Study, May 1983.

FIGURE 8-2. TYPES OF FARE EVASION BEFORE AND DURING SSFC

TRI-MET did not track incidence of vandalism or associated costs. Therefore, no data are available.

8.5 FARE COLLECTION COSTS

SSFC annual fare collection costs totaled \$712,200; traditional fare collection costs totaled \$464,500. Table 8-4 itemizes these costs.

In-house collection costs comprise the cost of ticket clerks, and fare box pulling and transporting. Traditional fare collection in-house collection costs include an additional employee for sorting dollar bills. TRI-MET estimates that dollar bill use would be higher with traditional fare collection than with SSFC because with traditional fare collection the percentage of cash-paying passengers was higher.

Ticket and pass costs include printing costs and sales commissions. SSFC costs include these costs for multi-ride and single-ride tickets and passes while traditional fare collection costs include these costs for 10-ticket booklets and passes.

Fare collection system management costs include management information system operation, public affairs staff time, and operations. SSFC requires (1) substantially more of these services than was required by traditional fare collection and (2) a fare collection manager, which was not required by traditional fare collection.

SSFC costs include estimates of revenue losses caused by fare collection equipment failures.

8.6 ADVERTISING REVENUE

Advertising revenue is an estimate of annual revenue from selling advertising space on the back side of tickets and passes. Annual advertising revenues with SSFC were estimated at \$18,000, twice that of traditional fare collection. With SSFC, every cash passenger received a ticket so potential revenues were greater than with traditional fare collection in which cash passengers do not receive proof of payment.

8.7 COMPARISON WITH TRADITIONAL FARE COLLECTION

SSFC was more than three times more costly to operate than was the traditional fare collection system. The annual cost difference was approximately \$3,400,000 (Table 8-5). These cost estimates do not include the higher vandalism costs of SSFC.

Net fare evasion and enforcement costs accounted for 64 percent of the SSFC operating costs, while maintenance costs accounted for 21 percent.

TABLE 8-4

ANNUAL FARE COLLECTION COSTS OF SSFC AND TRADITIONAL
FARE COLLECTION

	<u>SSFC</u>	<u>TRADITIONAL FARE COLLECTION</u>
In-House Collection	\$944,900	\$370,800
Armored Car Service	7,600	7,300
Tickets & Passes	239,600	71,400
System Management	106,800	15,000
Equipment Downtime Revenue Losses	<u>20,400</u>	<u>0</u>
Total Annual Fare Collection Costs	\$712,200	\$464,500

Source: TRI-MET.

TABLE 8-5
ANNUAL OPERATING COSTS OF SSFC AND
TRADITIONAL FARE COLLECTION

	<u>SSFC</u>	<u>Traditional Fare Collection</u>
Equipment Maintenance	\$ 944,900	\$ 3,900
Enforcement	1,659,600	0
Surcharge Fare Collections	(\$ 329,600)*	0
Fare Evasion	1,692,000	800,000
Vandalism	- Data Not Available -	
Fare Collection	712,200	464,500
Advertising Revenue	(18,000)*	(9,600)*
Total Annual Operating Costs	\$4,661,100	\$1,258,800

* Revenues

Source: TRI-MET.

9. EFFECTS ON TRAVEL BEHAVIOR, FARE PAYMENT, AND RIDER ATTITUDES

This section discusses (1) the effects on bus travel behavior of self-service fare collection and the new zone structure; (2) the effects on fare payment of discounted pre-paid fares; and (3) rider attitudes toward:

- . transit service changes;
- . factors determining fares;
- . fare evasion; and
- . fare enforcement.

TRI-MET conducted the following surveys to obtain these data:

- . pre-SSFC rider on-board/mail-back survey (May 1982);
- . SSFC rider on-board/mail-back survey (March 1983);
and
- . SSFC panel survey (March 1983).

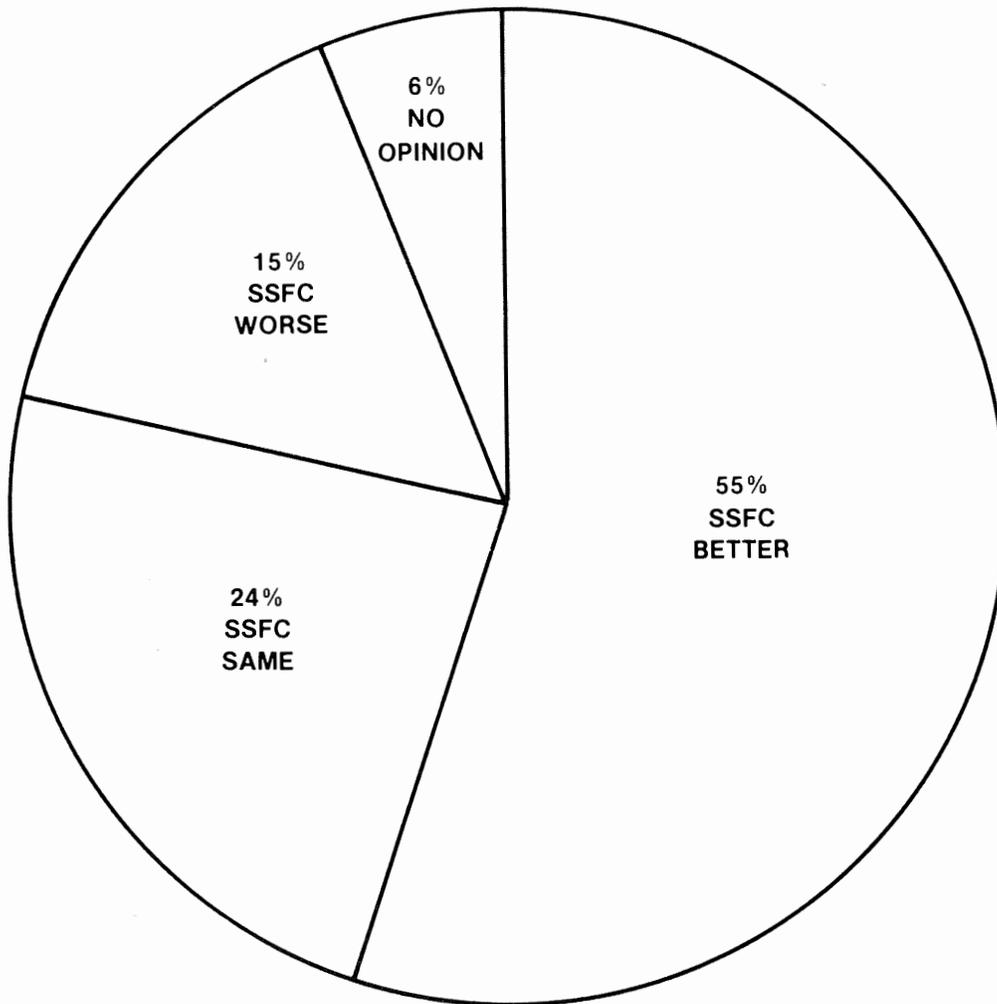
Appendix A presents the survey instruments. Appendix F discusses data collection and analysis.

To present attitudes in the proper context of riders rather than trips, the problem of trip frequency bias encountered in all on-board rider surveys was addressed by applying Transportation Systems Center corrective statistical procedures.*

9.1 TRAVEL BEHAVIOR EFFECTS

Overall, most riders considered SSFC better than or the same as the prior fare collection system. Only 15 percent of those responding to the survey considered it worse (Figure 9-1).

* L.B. Doxsey, Respondent Trip Frequency Bias in On-Board Surveys, mimeographed paper, Transportation Systems Center, U.S. Department of Transportation, December 1982.



Source: TRI-MET On-Board Survey (March 1983)

FIGURE 9-1. RIDER ATTITUDE TOWARD SSFC AS COMPARED WITH TRADITIONAL FARE COLLECTION

Despite the apparent rise in rider satisfaction during SSFC, rider travel demand did not increase. Of respondents to the panel survey, 90 percent stated that they did not increase or decrease their use of transit after SSFC was implemented. The 3 percent who traveled more did so because of greater convenience, easier ticketing, and faster boarding. The 2 percent who traveled less indicated it was because SSFC was more confusing than the former fare collection system.

The new zone structure, which made TRI-MET's fares more distance-based, did not cause a shift in the pattern of passenger trips. Under the new structure, zones 1 and 2 were similar to the old zones 1 and 2, and zones 3, 4, and 5 covered the area covered by old zone 3 (Figure 3-2 in Chapter 3). Therefore a general comparison can be made between 3-zone trips under the old zone structure and 3-or-more-zone trips under the SSFC zone structure.

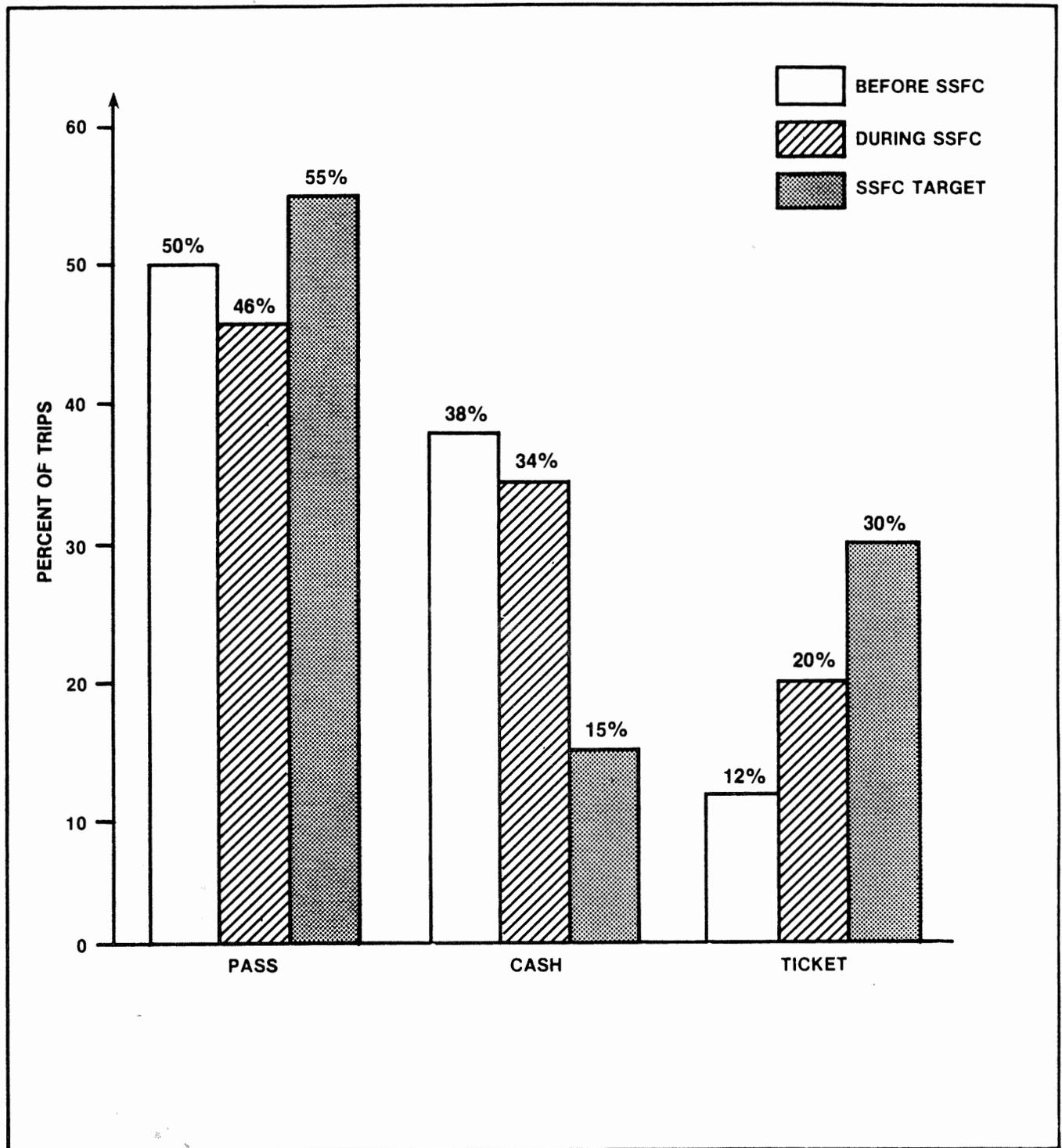
Before SSFC (May 1982), 24 percent of weekday trips were 3-zone trips. During SSFC (May 1983), 24 percent of weekday trips were 3 or more zones. Therefore, the new zone structure did not affect the pattern of trips.

9.2 FARE PAYMENT CHANGES

TRI-MET believed that for SSFC to increase bus operating productivity to the fullest extent possible, it needed to reduce use of cash fares. To encourage greater use of prepaid fares after SSFC, TRI-MET discounted 10-ride tickets by 8 to 33 percent and discounted passes by 20 to 23 percent. TRI-MET targeted pass use to increase from 50 to 55 percent of all trips, ticket use to increase from 12 to 30 percent, and cash use to decline from 38 to 15 percent.

Changes in fare payment did not meet TRI-MET's targets. Cash use declined some but was short of TRI-MET's 15 percent target (Figure 9-2). Pass use declined instead of rising, as targeted, and ticket use rose but was short of TRI-MET's target by 10 percent.

It is unlikely that TRI-MET could have lowered cash use further. Most cash passengers preferred paying cash because they were infrequent transit users. The principal reasons given in the rider mail-back survey for using cash rather than 10-ride tickets were infrequent transit use (62 percent) or a preference for cash (19 percent). No more than 9 percent cited other reasons such as ticket outlets are inconvenient to get to, tickets are too expensive, or don't know where tickets are available. Cash fares accounted for only 34 percent of trips as compared with 51 percent of riders.



Source: TRI-MET Rider Surveys (On-Board) May and June 1982 , and March 1983

FIGURE 9-2. FARE PAYMENT AS A PECENTAGE OF TOTAL TRIPS

9.3 TRANSIT SERVICE CHANGES

TRI-MET asked riders their perceptions of SSFC changes in travel time and problems with fare collection. The following subsections discuss survey responses.

9.3.1 Travel Time

Most riders (63 percent) thought boarding and alighting from buses were faster under SSFC than under the former system. Only 5 percent found it slower. The remainder either did not know or were not aware of any change in boarding time. According to the results of the bus stop dwell time survey, boarding times decreased but alighting times increased with SSFC and average dwell time per passenger remained the same.

In contrast to riders' perceived decrease in boarding and alighting times, results of the panel survey suggest that riders did not perceive this decrease as leading to an overall reduction in trip time. Most panel survey respondents (80 percent) believed that their usual trip time remained unchanged under SSFC; only 20 percent believed trip time had decreased. As travel time did not decrease with SSFC, the perceptions of decreases in travel time may have been the result of TRI-MET's successful marketing campaign.

9.3.2 Fare Collection Problems

Fewer riders perceived the need for exact change to be a problem under SSFC than did before SSFC. The small decrease in the need for exact change was probably caused by the small decline in the use of cash fares.

More riders perceived fare payment delays to be a problem during SSFC than had before SSFC. The frequent SSFC equipment breakdowns may have caused the increase. The SSFC on-board rider survey found that, during the month of the survey, 63 percent of riders encountered collection equipment breakdowns. Of those, 87 percent encountered collection equipment breakdowns up to four times a month.

According to results of the SSFC rider panel survey, 20 percent of the riders believed fare collection equipment was reliable; 42 percent believed it was somewhat reliable; and 5 percent believed it was not reliable. The remainder did not know (as they probably used passes).

Zone boundary uncertainty increased only slightly with SSFC. As the number of zones increased from three to five, the slight increase indicated a successful TRI-MET marketing program to educate the public about the new fare zones.

SSFC eliminated some problems and created some new ones. SSFC eliminated uncertainty over outbound and inbound payment. Before SSFC, some trips required payments when boarding buses; some required payment when alighting from buses. With SSFC, passengers paid only when boarding buses. New fare collection problems with SSFC were uncertainties over fare time limits and misunderstandings of ticket information. SSFC tickets and receipts had different expiration times and contained information on boarding and alighting zones and boarding time. Figure 9-3 compares the before and during SSFC fare collection problems, as perceived by riders.

9.4 FACTORS DETERMINING FARES

Most riders both before and during SSFC indicated trip distance and rider age should be considered in determining fares. Under SSFC, the refinement of zone structure and the continuation of reduced fares for senior (honored) citizens and youths was responsive to these factors. Figure 9-4 compares the before and during SSFC attitudes of TRI-MET riders on factors that should be considered in setting fares.

The rider panel survey showed 61 percent of the riders considered SSFC more fair than the old fare structure, as against 35 percent who considered it less fair.

9.5 FARE EVASION

TRI-MET asked riders their attitudes toward extent of fare evasion and reasons for fare evasion. The following subsections discuss survey responses.

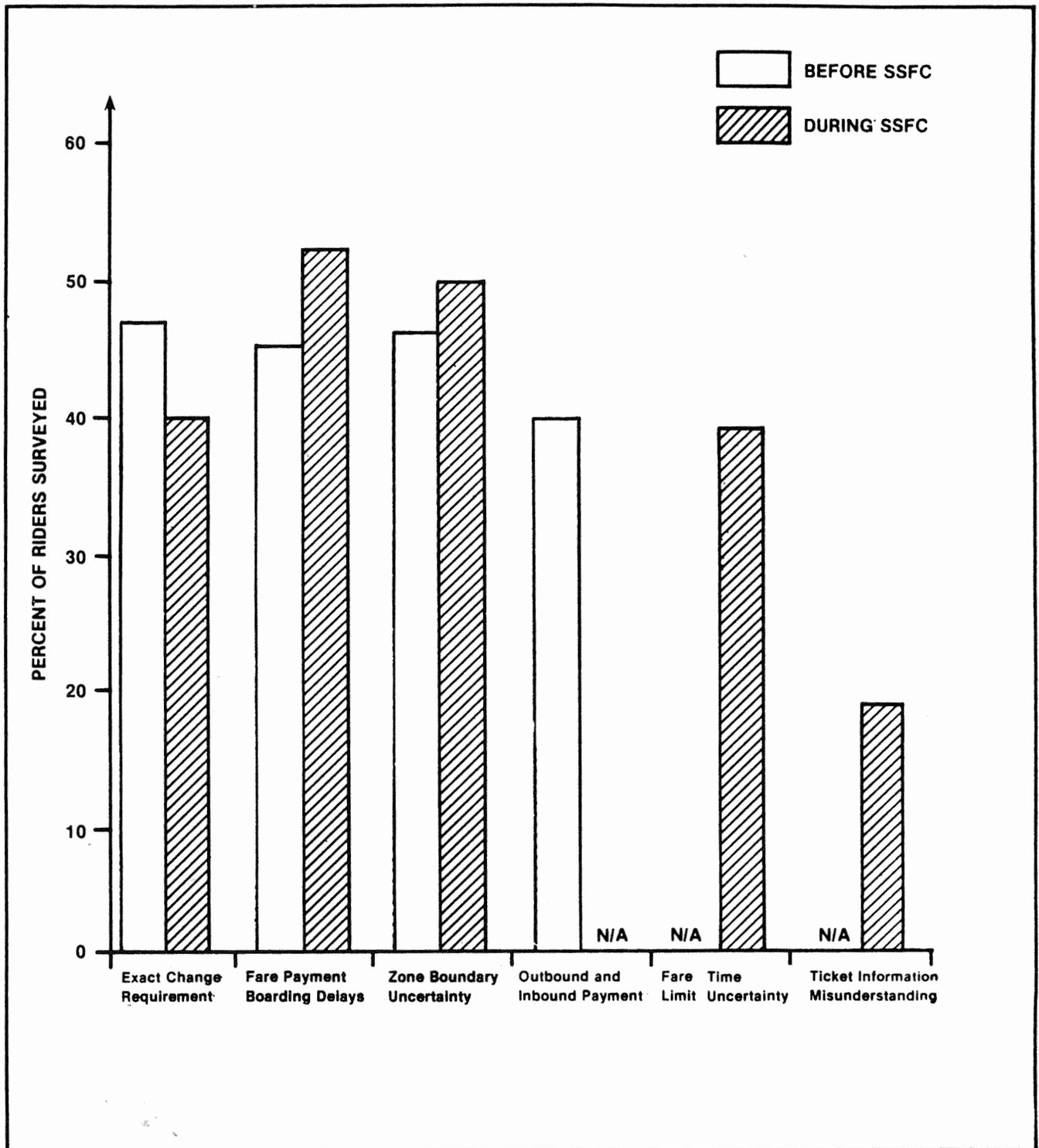
9.5.1 Extent of Fare Evasion

Both before and during SSFC, slightly more than 50 percent of the riders believed the fare evasion rate was between 3 and 10 percent (Figure 9-5).

Although perceptions of fare evasion levels during SSFC rose only slightly, 36 percent believed that fare evasion had increased as compared with only 20 percent who believed more riders paid the correct fares.

The findings of the rider panel survey were consistent with the above results. Almost 38 percent believed fare evasion had risen as compared with 32 percent who believed that fare evasion had declined. The remaining 30 percent believed fare evasion was the same under both fare collection systems.

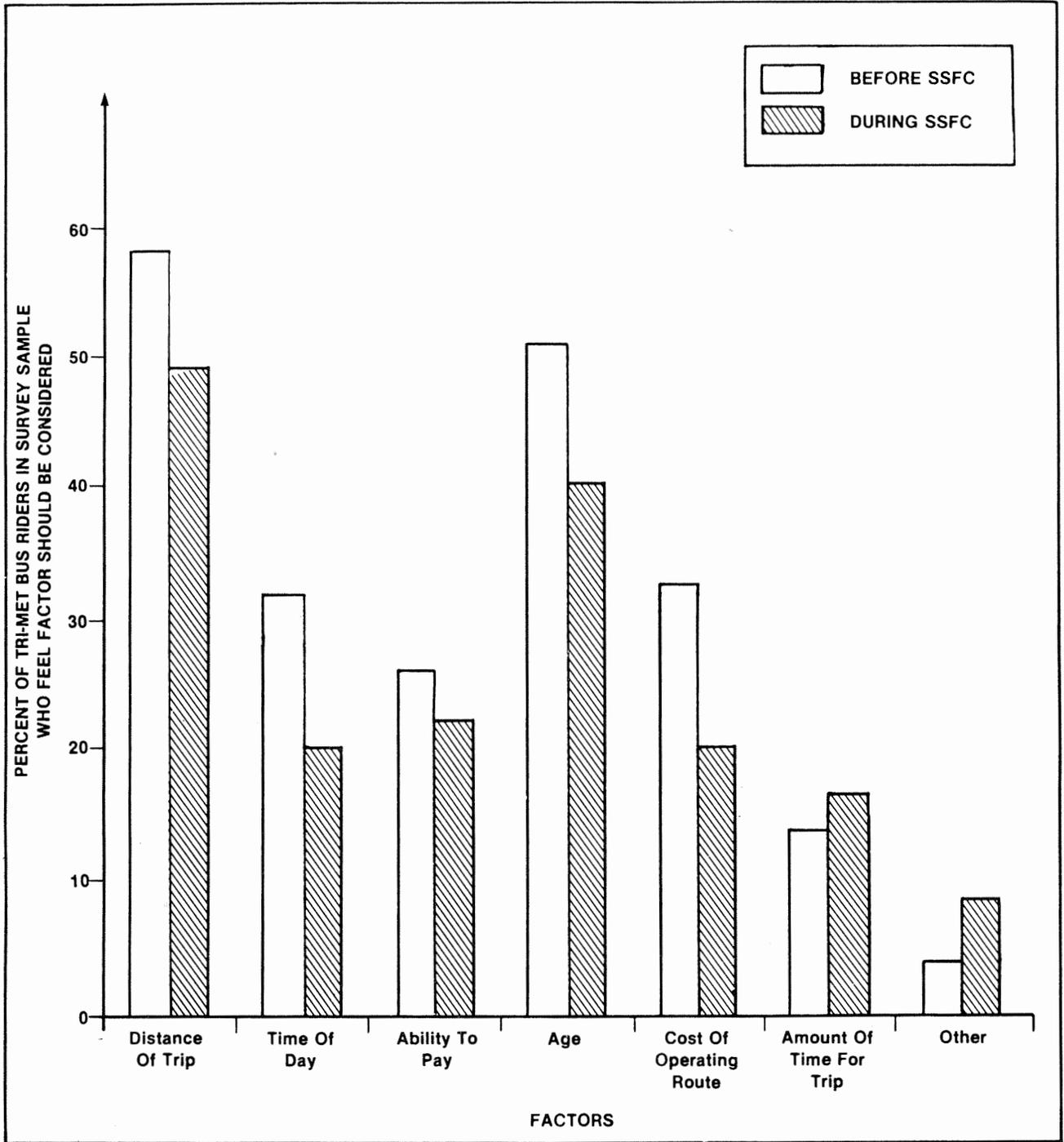
Perceptions of fare evasion increases were low as evasion had increased during SSFC. In fact, revenue losses from fare evasion more than doubled.



N/A = Not asked in before SSFC or during SSFC Survey.

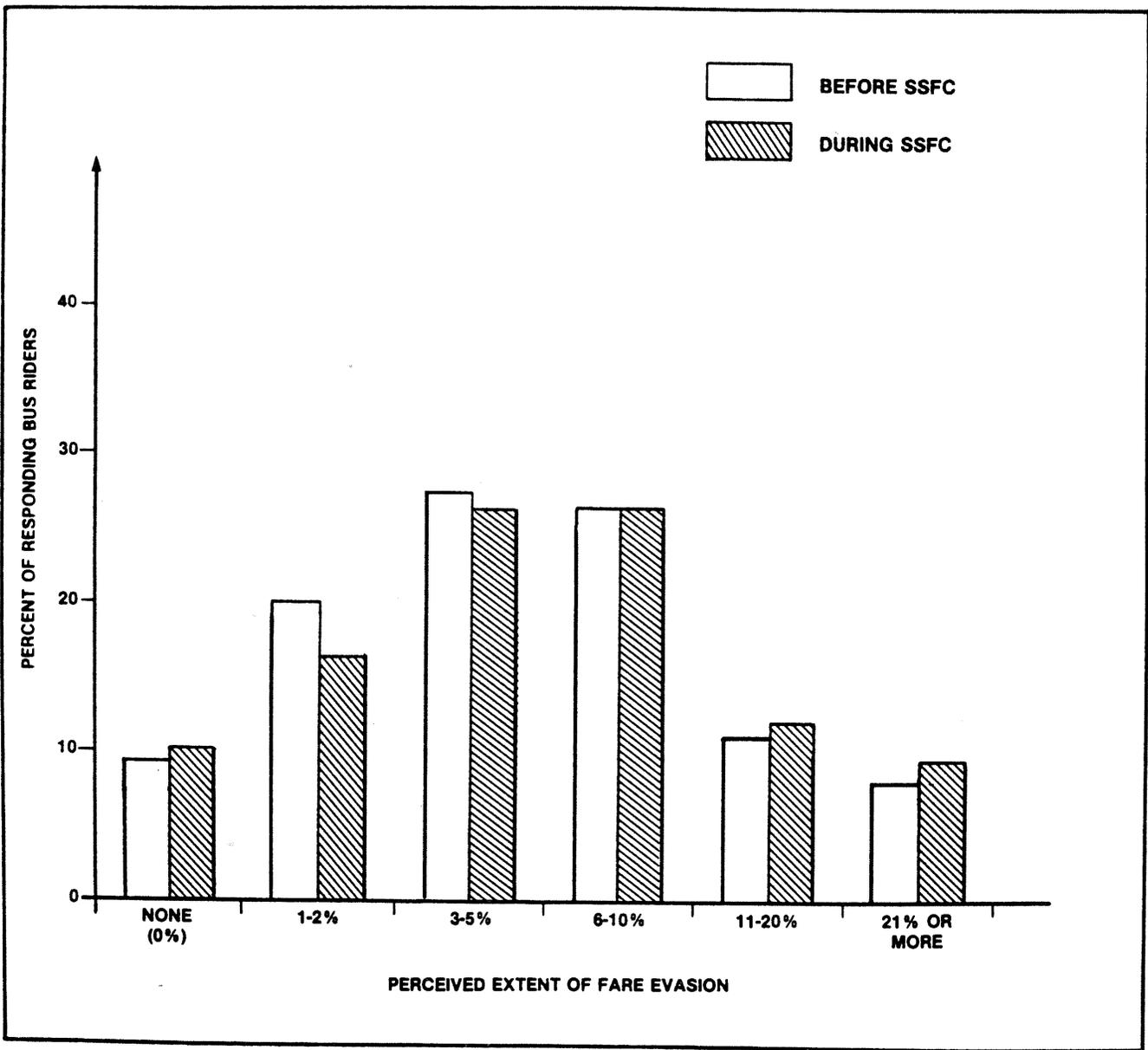
Source: TRI-MET Pre-SSFC (May and June 1982) and SSFC (March 1983) On-Board Surveys.

FIGURE 9-3. FARE COLLECTION PROBLEMS PERCEIVED BY RIDERS



Source: TRI-MET Rider Survey, May and June 1982 (Mail-Back)
 TRI-MET Bus Rider Survey, March 1983 (Mail-Back)

FIGURE 9-4. TRI-MET RIDER PERCEPTIONS OF FACTORS THAT SHOULD BE CONSIDERED IN SETTING FARES



Source: TRI-MET Bus Rider Survey, May and June 1982 (Mail-Back)
 TRI-MET Bus Rider Survey, March 1983 (Mail-Back)

FIGURE 9-5. TRI-MET RIDER PERCEPTIONS OF THE EXTENT OF FARE EVASION

9.5.2 Reasons for Fare Evasion

Before SSFC, of those riders who believed that fare evasion occurred, the main reasons given for riders failing to pay the correct fare were lack of correct change and drivers can't or won't do anything. The latter reason is consistent with the reason given in the before SSFC TRI-MET bus operator survey.

During SSFC, the predominant reason cited for fare evasion was the low probability of being inspected (Figure 9-6). (TRI-MET's inspection rate averaged 2.9 percent.)

9.6 FARE ENFORCEMENT

TRI-MET asked riders their attitudes toward fare evasion penalties and inspections. The following subsections discuss survey responses.

9.6.1 Fare Evasion Penalties

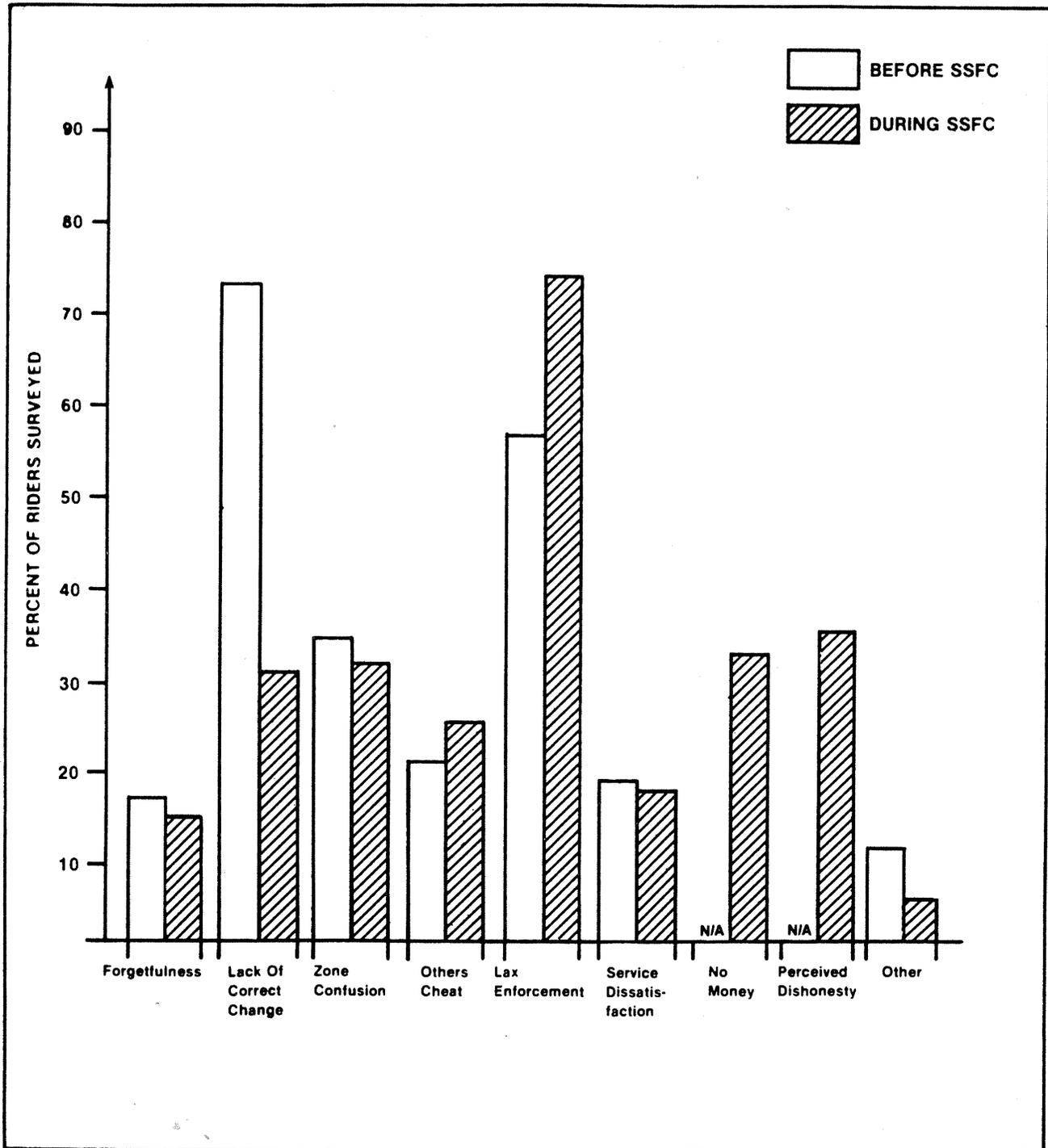
During SSFC, riders' attitudes shifted toward favoring stringent penalties and fines for both intentional and unintentional fare evaders. However, more than 50 percent of SSFC riders wanted unintentional fare evaders treated leniently. Of the penalty alternatives, support for the \$20 surcharge for intentional fare evaders increased the most.

The attitudinal change toward intentional and unintentional fare evasion was reinforced by opinions gathered from the rider panel survey. During SSFC, rider support increased for the existing penalty level of \$20. When fare evasion was attributed to driver errors or equipment failures, riders did not support surcharges. Riders however, did support issuing surcharges for fare evasion due to forgetfulness.

These results suggest rider support for TRI-MET's criteria for issuing surcharges. TRI-MET did not issue surcharges for equipment failures but gave surcharges to riders who claimed forgetfulness.

9.6.2 Inspections

Nearly half the riders responding to the TRI-MET rider survey indicated having been inspected. These riders were checked an average of three times during the month before the survey. Of SSFC riders, 38 percent stated that fares should be checked more frequently. The remainder stated that fare inspections should be maintained at the current level (27 percent), less often (12 percent), or did not know (23 percent). These findings suggest that a large portion of riders would support more intensive fare inspection and enforcement.



Source: TRI-MET Rider Mail-Back Surveys (May 1982 and March 1983).

N/A = Not asked

FIGURE 9-6. RIDER PERCEPTIONS OF REASONS FOR FARE EVASION

The same rider survey found that 78 percent of respondents viewed inspectors as professional, friendly, or helpful. The balance viewed inspectors as intimidating or a nuisance. Although nearly 70 percent believed inspectors performed well or fairly well, 11 percent believed inspectors could improve their performance. The remainder expressed no opinion. The main reason cited by riders who believed inspectors perform poorly was that there were too few of them. These survey responses suggest that TRI-MET's extensive inspector training program was successful.

10. OPERATOR ABSENTEEISM AND PERCEPTIONS

This section discusses bus operator absenteeism during SSFC and operators' perceptions of SSFC and its effect on operators, service, and fare evasion. Data sources were TRI-MET attendance data and TRI-MET operator surveys before and during SSFC. TRI-MET conducted the "before" survey in February and March 1982 during SSFC instructional classes and the "during" survey in May 1983, nine months into the demonstration. TRI-MET developed the surveys, which are presented in Appendix A.

10.1 ABSENTEEISM

TRI-MET expected that SSFC would reduce the stress that bus operators experienced when enforcing fares and, as a result, reduce operator absenteeism. However, because of several exogeneous factors, the effect of SSFC on operator absenteeism cannot be determined.

Figure 10-1 presents TRI-MET's monthly operator absenteeism rates before SSFC, during SSFC, and during partial SSFC. As shown in the figure, absenteeism rates were lower with SSFC and partial SSFC than before SSFC. However, factors other than SSFC affected operator absenteeism and the effects of SSFC cannot be separated from those of the exogeneous factors.

In September 1982 when SSFC began, TRI-MET expanded transit service and hired approximately 200 new operators. TRI-MET's new operators had a 6-month probationary period. Historically, TRI-MET's drivers on probation had fewer absences from work than did veteran drivers. Thus, the lower absenteeism of the new operators lowered the absenteeism rate for the first months of SSFC. TRI-MET believed that the lower absenteeism of the first few months of SSFC also was lowered by the newness of SSFC and an attitude among employees of working hard to make SSFC work.

Lower absenteeism rates in 1983 were due in part to TRI-MET taking a stricter stance toward operator absenteeism, beginning in January of that year. In January 1984, TRI-MET again instituted a stricter policy toward operator absenteeism.

Absenteeism rates for the first few months of partial SSFC were affected by a program to reduce the number of operators on the payroll. This program involved laying off all part-time drivers, allowing early retirement for approximately 185 full-time drivers, and then rehiring part-time drivers. Many operators who were to be laid off took sick leave to look for other jobs, thus increasing absenteeism.

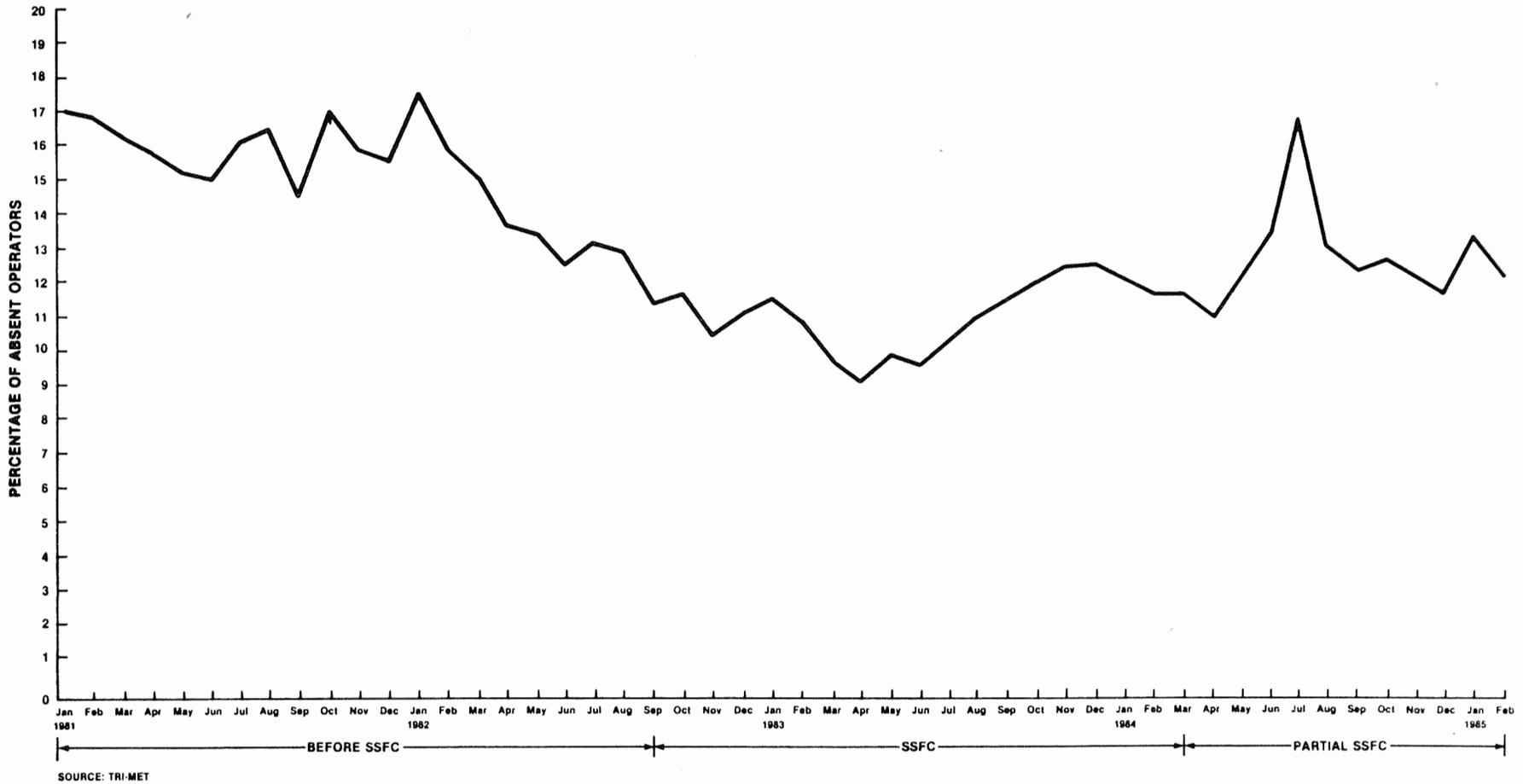


FIGURE 10-1. MONTHLY OPERATOR ABSENTEEISM RATES FOR BEFORE, DURING, AND AFTER SSFC

10.2 PERCEPTIONS OF SSFC

Only 48 percent of the operators believed SSFC was better than the prior fare collection system; 36 percent believed it was worse, and 16 percent believed it was the same (Figure 10-2). The major reasons cited for perceiving SSFC as an improvement were that SSFC made fare collection easier for drivers and passengers and that it improved bus operations. These points were stressed during SSFC training classes. The major reasons cited for perceiving SSFC negatively were increased fare evasion and unreliable fare equipment.

10.3 EFFECTS ON OPERATORS

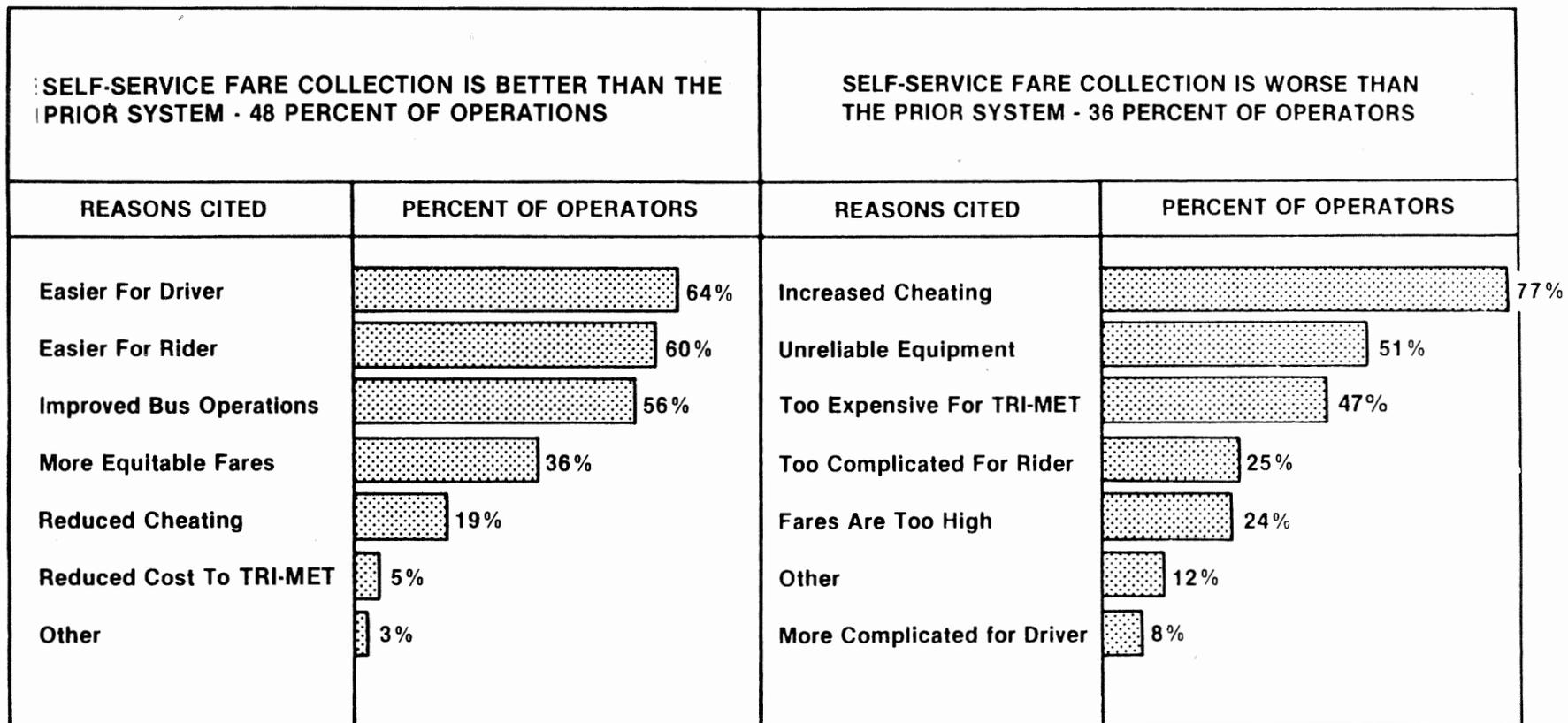
A majority of the bus operators (62 percent) believed that SSFC improved their driving performance because they could direct more attention to driving the bus during SSFC than before SSFC. Only 10 percent found driving more difficult. The remainder believed SSFC did not affect driving performance.

Both the before and during SSFC surveys asked operators to rate the difficulty of selected bus operations. SSFC eliminated and eased the difficulty of some tasks, added tasks, and increased the difficulty of other tasks (Figure 10-3). SSFC eliminated dealing with transfers, the fourth most difficult task before SSFC, and nearly halved the percentage of operators who found collecting cash fares to be difficult. The percentage of operators who perceived dealing with overcrowding as difficult declined a third. This decline was probably due to (1) the introduction of articulated buses, and (2) all doors boarding under SSFC. During SSFC, 59 percent of boarding passengers used the front doors and 41 percent used the rear doors.* The all-doors boarding may have improved the distribution of passengers on crowded buses.

SSFC added a task, operating fare equipment, which almost all operators found easy. However, the percentage of operators who perceived other tasks as difficult increased by a third.

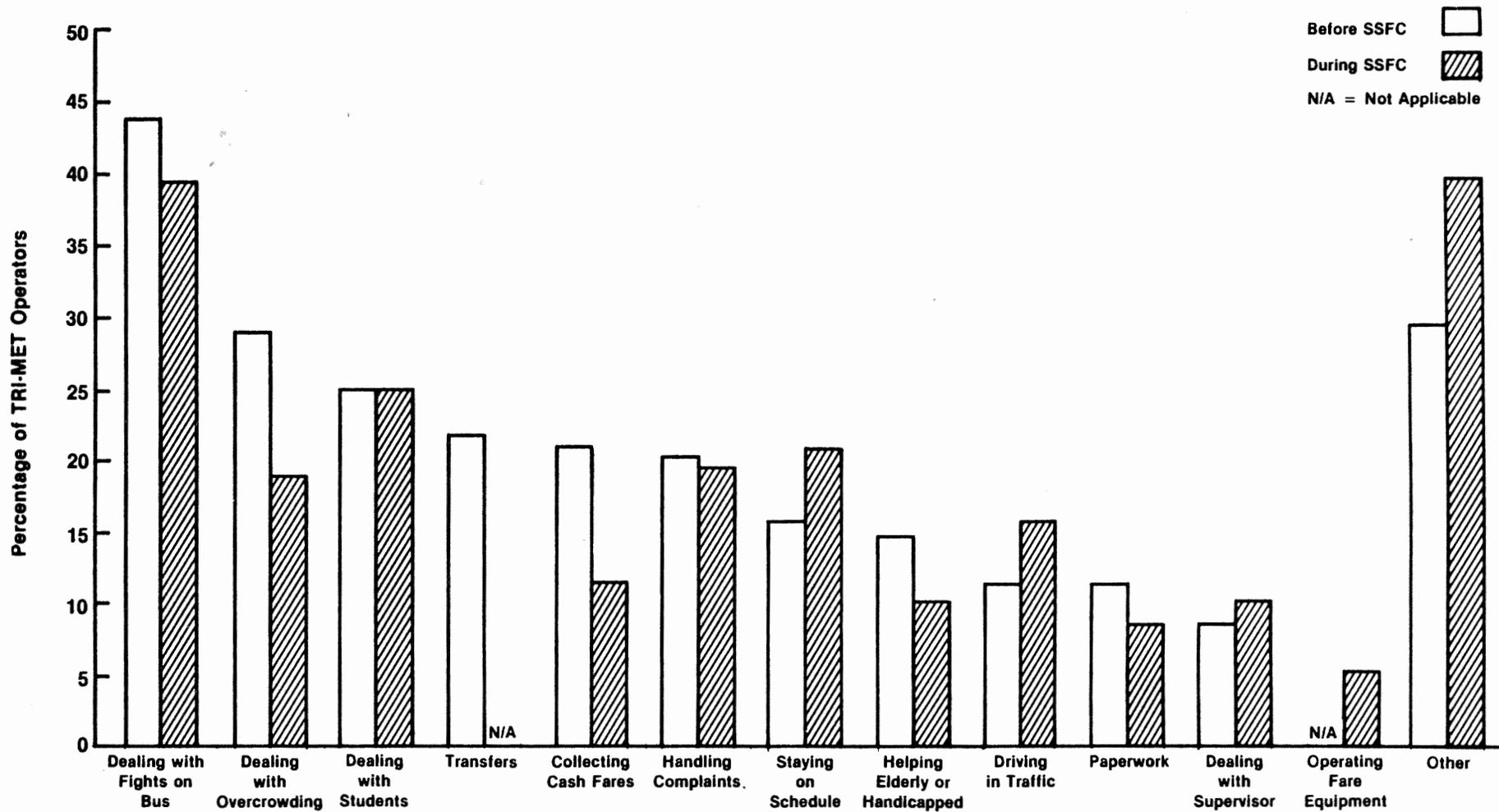
Operators were asked how SSFC affected the number of questions and comments from passengers and whether they liked interacting with passengers. Of the operators, 44 percent believed the number of questions and comments remained the same during SSFC, 30 percent believed it increased, and 26 percent believed it decreased. A majority (59 percent) preferred interacting with passengers, a few (16 percent) did not like interacting with passengers, and the balance had no opinion on the issue.

* TRI-MET Bus Stop Dwell Time Survey.



Source: TRI-MET Bus Operator Attitude Survey, May 1983

FIGURE 10-2. TRI-MET OPERATOR PERCEPTIONS OF SELF SERVICE FARE COLLECTION (DURING SSFC)



SOURCE: TRI-MET Bus Operator Attitude Surveys (February 1982 and 1983)

FIGURE 10-3. OPERATOR PERCEPTIONS OF DIFFICULTY OF BUS OPERATIONS

10.4 EFFECTS ON OPERATIONS

Under SSFC, 43 percent of operators believed boarding and alighting times had decreased, 23 percent believed they had increased, and the remainder perceived no change from the prior system. The results of the bus stop dwell time surveys showed that, under SSFC, boarding times decreased but alighting times increased. TRI-MET emphasized SSFC's potential to reduce boarding and alighting times during operator training sessions.

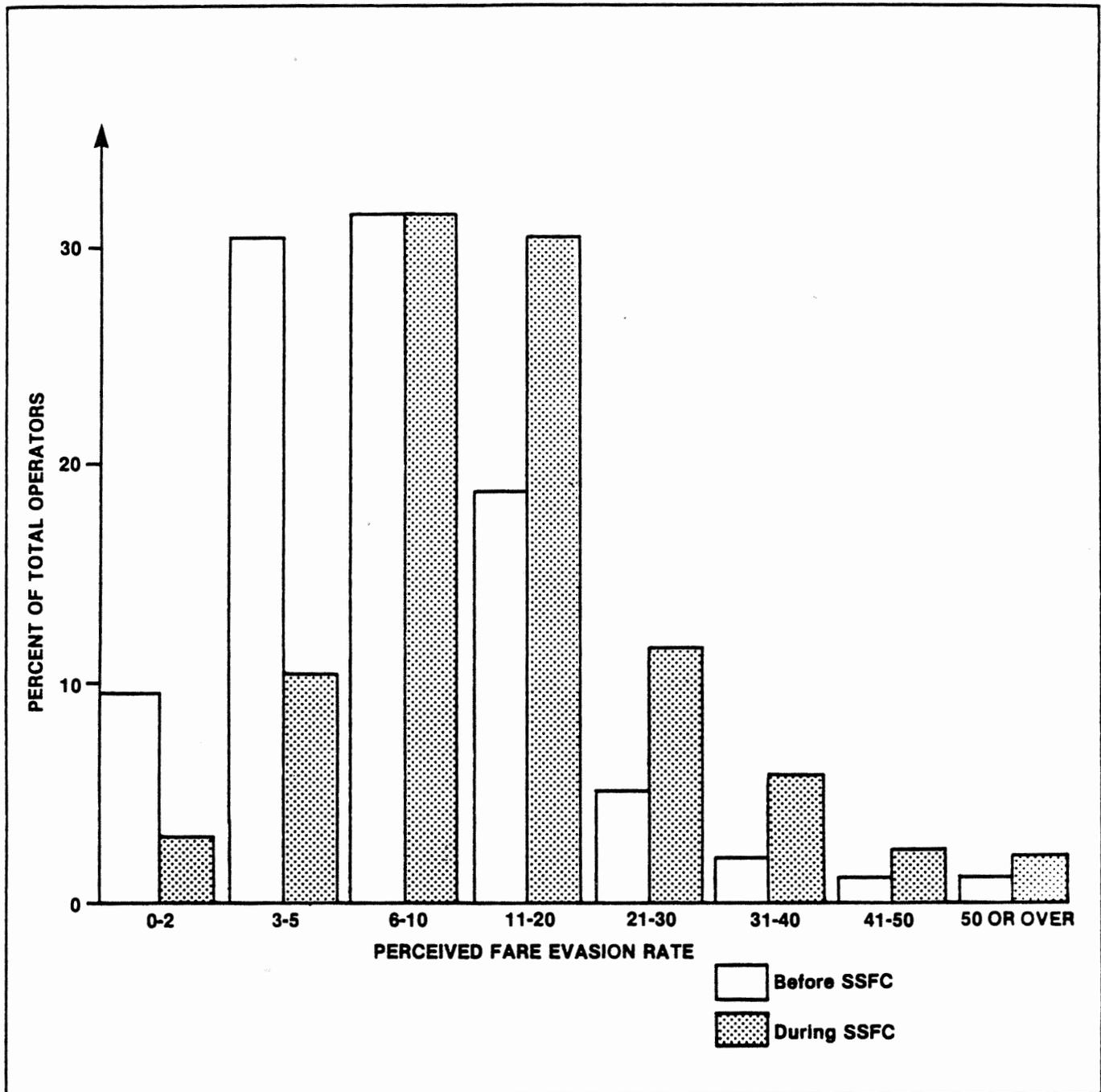
Operator opinion on the effects of SSFC on bus speeds was similar to that for SSFC's effects on boarding and alighting times. Of the operators, 43 percent believed operating speeds had increased, 28 percent believed operating speeds had decreased, and 29 percent believed they had remained the same. Results of the mall run time surveys showed that operating speeds declined during SSFC.

10.5 EFFECTS ON FARE EVASION

In the bus operator survey, about 66 percent of bus operators believed fare evasion had risen, 13 percent believed it had decreased, and the remainder perceived no change. Figure 10-4 presents fare evasion rates as perceived by TRI-MET operators before and during SSFC. Before SSFC, 63 percent believed that the fare evasion rate was between 3 and 10 percent. During SSFC, almost 60 percent believed that the fare evasion rate was between 6 and 20 percent, twice the prior level. TRI-MET estimated that revenue losses from fare evasion more than doubled during SSFC.

TRI-MET operators were asked how often various types of fare evasion occurred. Before SSFC, operators perceived use of bad transfers, insufficient zone fare, and special fare pass misuse as the most common fare evasion types. Before SSFC, zone fare evasion and farebox shortchanging were the most common forms of fare evasion. During SSFC operators perceived no payment and zone fare evasion as the most common fare evasion types. The most common types of fare evasion during SSFC were no payment and farebox shortchanging.

Operators believed that most fare evaders were under 25 years of age; that evasion mostly occurred during the evening and early morning, and on weekends; and that fare evasion was highest in the suburbs. TRI-MET reported that youths, particularly students, evaded fares and TRI-MET did not conduct fare inspections after 10 p.m. Outlying suburban routes were inspected less frequently than more urban routes because ridership was lower on the suburban routes.



Source: TRI-MET Bus Operator Attitude Surveys February 1982 and May 1983

FIGURE 10-4. FARE EVASION RATE

11. CONCLUSIONS

This chapter provides an assessment of the Portland, Oregon, SSFC demonstration and considers the transferability of these findings to potential SSFC applications in other cities.

11.1 SSFC IN PORTLAND

After approximately 20 months of systemwide use of SSFC, TRI-MET changed to conventional fare collection except in Fareless Square where SSFC was continued on weekdays from 6:30 a.m. to 6:30 p.m. (Note that TRI-MET plans to use SSFC on its new light rail system.)

The following major factors motivated TRI-MET to limit SSFC use on buses:

- . High fare evasion. Revenue losses from fare evasion during SSFC were more than twice those before SSFC. Annual revenue losses during SSFC approached \$1.7 million.
- . High enforcement costs. SSFC fare enforcement costs were high. Annual costs were \$1,659,600 for SSFC as compared with none for traditional fare collection. Even though expenditures for fare enforcement were substantial under SSFC, they bought only limited coverage (only 2.9 percent of passengers were inspected) and ineffective enforcement.
- . Unreliable fare collection equipment. The fare collection equipment that TRI-MET used proved unreliable and costly to maintain. Annual equipment maintenance costs totaled \$944,900. A consultant who conducted an audit of the equipment stated that annual maintenance costs of reliable equipment would have cost \$361,200.
- . No productivity improvements. All-doors boarding with SSFC did not reduce bus dwell times. Even if SSFC had reduced dwell times, anticipated increases in bus productivity would not have been realized because average dwell times were shorter than TRI-MET's shortest headways. The savings from anticipated productivity improvements had been a major justification for implementing SSFC.
- . Low surcharge collections. TRI-MET was only able to collect 27 percent of its surcharges. In contrast, the Metropolitan Transit Development Board (MTDB) in San Diego was able to collect 53 percent of its

citations. If all TRI-MET surcharges had been paid at the average payment of \$28.78, collections for the period September 1982 through February 1984 would have totaled \$2,082,780. (Actual collections totaled \$392,533.) Surcharge collections were enough to cover the cost of collecting surcharges but were not enough to cover the cost of enforcement.

- . Limited court system cooperation. TRI-MET initially avoided using the courts to prosecute fare evaders because the courts were reluctant to take on additional cases. After collection agencies and small claims court proved ineffective in collecting surcharges, and repeat evaders became a problem, the courts agreed to prosecute evaders with four or more outstanding surcharges. TRI-MET then issued citations, not surcharges, to evaders with four or more outstanding surcharges and, after two citations and missed court appearances, the courts issued arrest warrants. In contrast, evaders in San Diego could be arrested for their first offense for failing to pay the fine and failing to appear in court.
- . Limited fare inspector power. Under Oregon statutes, TRI-MET's fare inspectors did not have the authority to issue citations or to arrest fare evaders. Inspectors had to radio transit police who issued citations or arrested fare evaders. The lack of power of fare inspectors probably contributed to the ineffectiveness of enforcement efforts. In San Diego, fare inspectors could issue citations and arrest evaders.

11.2 SSFC BUS APPLICATIONS

According to its proponents, SSFC has the potential to offer productivity savings on bus routes that have high numbers of boarding and alighting passengers. These bus routes are located primarily in large cities. However, many of the problems encountered with SSFC in Portland are problems that probably would occur in most large cities. In summary, for SSFC to be successful on buses in large cities, the following problems encountered in this Portland demonstration need to be overcome:

- . Increased fare evasion. The opportunities for evading fares on buses increased dramatically after SSFC was put into use. Experience in Portland suggests that, with SSFC on buses, revenue losses could increase substantially.

- . High enforcement costs. The high number and relatively low use of buses and the complexity of the bus service caused the labor costs of inspection to be high. TRI-MET's substantial expenditures on fare inspection bought low inspection levels (2.9 percent) that, in combination with its penalties (\$20 fare surcharges and limited use of notices to appear in court), failed to deter evasion. Higher inspection levels and more stringent penalties are probably needed to deter evasion. However, inspection levels high enough to deter evasion would be prohibitively expensive on bus systems. In contrast, rail systems experience relatively high use of trains on a simple service network, making inspection on rail systems easier and more cost-effective than on bus systems.
- . Limited potential for productivity improvements. Dwell time savings on buses, if they result at all from SSFC, may be too small to bring about operating savings except on routes with short headways. Since only the variable portion of dwell times can be lowered, cumulative savings amounting to a headway are unlikely unless the headways are extremely short.
- . Low surcharge/fine collections. Transit systems implementing SSFC on buses may not collect a substantial portion of the surcharges or fines. A high surcharge collection rate is needed to offset high SSFC operating costs on buses. TRI-MET was only able to collect 27 percent of its surcharges. In San Diego, MTDB was more successful but only collected 53 percent of its citations. The surcharge collection rate will probably be low in future SSFC bus applications because (1) fare evaders often provide false identification and addresses, (2) evaders ignore fines or surcharges relatively easily, and (3) the percentage of low income bus riders is high and collection from them is difficult.
- . Overburdened courts. Most courts in the United States are overburdened and reluctant to increase their caseloads or to devote the resources to pursue evaders aggressively. The caseload becomes an important consideration for SSFC on buses because the number of surcharges/citations would probably be high. TRI-MET's surcharges averaged 4,150 a month (September 1982 to December 1983) while MTDB's light rail line averaged 313 a month (July 1982 to October 1983).
- . Increased vandalism. In Portland, vandalism on buses increased after SSFC was implemented. In Denver, vandalism on buses increased during its free fare

demonstration. With SSFC on Portland buses, fare evasion was so easy that, just as in the Denver free fare demonstration, vandals rode buses more frequently.

The experience with SSFC in Portland illustrates the difficulty of SSFC enforcement when compared with enforcement of traffic or parking laws. Unlike motorists, bus riders do not have licenses for identification that can be withheld until all outstanding violations are paid. And unlike parking violators, many bus riders do not have assets that can be impounded. These differences make SSFC enforcement more difficult than traffic and parking law enforcement and undermine SSFC enforcement efforts. Thus, the results of this demonstration suggest that--except for special circumstances--it may be extremely difficult to implement SSFC for urban bus services in the United States.

In Europe, SSFC on buses is considered successful. An investigation of SSFC in Europe was not conducted for this evaluation. Therefore, the issue of why SSFC is considered successful there was not addressed in this report.

APPENDIX A
SURVEY INSTRUMENTS

PRE-SSFC OPERATOR SURVEY

OPERATOR SURVEY

Please answer all questions as completely and honestly as you can. Answers should be your own and reflect the average situation based on your experience. For questions 1 to 8, please check one box for each line of the question.

1. Bus riders can make mistakes paying the fare, either on purpose or because they are confused by the fare system. Of every 100 riders who board the bus, please estimate how many riders misuse or cheat the fare system: (Check one)

0 - 2	<input type="checkbox"/>	21 - 30	<input type="checkbox"/>
3 - 5	<input type="checkbox"/>	31 - 40	<input type="checkbox"/>
6 - 10	<input type="checkbox"/>	41 - 50	<input type="checkbox"/>
11 - 20	<input type="checkbox"/>	50 or over	<input type="checkbox"/>

2. Misuse or cheating of the fare system can occur in several ways. When misuse or cheating happens, how often is it done for each of these types of misuse or cheating:

	VERY RARELY	RARELY	SOMETIMES	OFTEN	VERY OFTEN
No payment at all	<input type="checkbox"/>				
Insufficient base fare	<input type="checkbox"/>				
No 3-zone cash fare	<input type="checkbox"/>				
Slugs, half bills, etc.	<input type="checkbox"/>				
Forged passes	<input type="checkbox"/>				
Misuse of youth, senior or disabled pass	<input type="checkbox"/>				
Wrong use of 2-zone pass for 3 zones	<input type="checkbox"/>				
Bad transfer	<input type="checkbox"/>				

3. How often do you question or confront a rider when they misuse or cheat the fare system for each of these types of misuse or cheating:

	VERY RARELY	RARELY	SOMETIMES	OFTEN	VERY OFTEN
No payment at all	<input type="checkbox"/>				
Insufficient base fare	<input type="checkbox"/>				
No 3-zone cash fare	<input type="checkbox"/>				
Slugs, half bills, etc.	<input type="checkbox"/>				
Forged passes	<input type="checkbox"/>				
Misuse of youth, senior or disabled pass	<input type="checkbox"/>				
Wrong use of 2-zone pass for 3 zones	<input type="checkbox"/>				
Bad transfer	<input type="checkbox"/>				

	VERY RARELY	RARELY	SOMETIMES	OFTEN	VERY OFTEN
4. Do your riders pay the wrong fare because:					
- They are confused by the zone system?	<input type="checkbox"/>				
- They see others cheating?	<input type="checkbox"/>				
- They know the operator can't do anything if they are caught?	<input type="checkbox"/>				
- They don't understand when to pay?	<input type="checkbox"/>				
- They believe fares are too high or unfair or service is poor?	<input type="checkbox"/>				
- Other _____	<input type="checkbox"/>				
5. How often do you think the following types of riders misuse the fare system?					
Age:					
- High school or younger	<input type="checkbox"/>				
- High school to age 25	<input type="checkbox"/>				
- 25 to 40 years	<input type="checkbox"/>				
- 40 to 65 years	<input type="checkbox"/>				
- Over 65 years	<input type="checkbox"/>				
Time of Day:					
- Rush hours	<input type="checkbox"/>				
- Mid-day	<input type="checkbox"/>				
- Evening	<input type="checkbox"/>				
- Early AM/Late PM	<input type="checkbox"/>				
- Weekends	<input type="checkbox"/>				
Part of Service Area:					
- Downtown	<input type="checkbox"/>				
- City	<input type="checkbox"/>				
- Suburban	<input type="checkbox"/>				
Repeat Cheaters	<input type="checkbox"/>				
6. What action do you usually use with riders who misuse the fare system?					
- Ask them to pay the fare	<input type="checkbox"/>				
- Ask them to pay or leave the bus	<input type="checkbox"/>				
- Call security/police	<input type="checkbox"/>				
- No action	<input type="checkbox"/>				
- Other _____	<input type="checkbox"/>				

	VERY RARELY	RARELY	SOMETIMES	OFTEN	VERY OFTEN
7. What is the response of riders who misuse the fare system to your asking for full fare?					
- Pay the full fare due	<input type="checkbox"/>				
- Pay part of the fare due	<input type="checkbox"/>				
- Leave the bus with no payment	<input type="checkbox"/>				
- Stay on the bus with no payment	<input type="checkbox"/>				
- Verbal abuse/swearing	<input type="checkbox"/>				
- Complain about poor service or high fares	<input type="checkbox"/>				
- Other _____					

	VERY EASY	EASY	NOT DIFFICULT	DIFFICULT	VERY HARD
8. What are the hardest or easiest parts of operating the bus for you?					
- Staying on schedule	<input type="checkbox"/>				
- Driving in traffic	<input type="checkbox"/>				
- Collecting cash fares	<input type="checkbox"/>				
- Transfers	<input type="checkbox"/>				
- Helping elderly or handicapped	<input type="checkbox"/>				
- Dealing with students	<input type="checkbox"/>				
- Handling complaints	<input type="checkbox"/>				
- Dealing with overcrowding	<input type="checkbox"/>				
- Dealing with fights on the bus	<input type="checkbox"/>				
- Paper work (load counts, reports, trip sheets, etc.)	<input type="checkbox"/>				
- Dealing with supervisors	<input type="checkbox"/>				
- Other _____	<input type="checkbox"/>				

9. What best describes your feelings towards misuse of the fare system? (Check one):

- Feel very angry when you see cheating and try to catch anyone who cheats?
- Feel very angry when you see cheating but feel enforcement is useless?
- Think better enforcement is needed but not by the operator?
- Enforce the worst cheating but feel that enforcement is a waste of time?
- Don't want to enforce because operators can't do much anyway?
- Don't want to enforce because management doesn't encourage or support operators?
- Don't want to enforce because of threat of violence or verbal abuse from the rider?
- Other _____

10. What are the usual feelings of other riders when you try to collect fares from cheaters? (Check one):

- Voice anger at the cheater
- Quietly indicate disapproval of cheater
- No response/don't care
- Quietly indicate disapproval of driver
- Voice support for the cheater

11. Based on what you have heard about the Self Service Fare Collection System, do you believe that it will be an improvement over today's system?

Yes No

If "yes", why? (Check those that apply)

- More equitable fares
- Reduced cheating
- Easier to use for rider
- Will reduce costs
- Will improve operations
- Easier for driver

Other _____

If "no", why? (Check those that apply)

- Fare too high
- Increased cheating
- Too complicated for rider
- Too expensive
- Unreliable equipment
- More complicated for driver

Other _____

12. Are you:

- Full Time Operator
- Regular Schedule
- Extra Board
- Mini Run Operator

What is your age?

- Under 30
- 30 - 39
- 40 - 49
- 50 - 59
- 60/over

13. List three routes you are most familiar with: # _____ # _____ # _____

Thank you for your assistance. Please give us any further comments regarding the fare collection process or driver fare collection responsibilities below.

SSFC OPERATOR SURVEY

OPERATOR SURVEY

Please answer all questions as completely as you can. Answers should be your own and reflect the average situation based on your experience. Please check one box for each question unless otherwise indicated.

1. How long have you been a Tri-Met bus operator?

_____ years _____ months

2. Based on your best estimate, out of every 100 bus riders, how many misuse or cheat the fare system, for whatever reason? (check one)

<input type="checkbox"/> 0-2	<input type="checkbox"/> 11-20	<input type="checkbox"/> 41-50
<input type="checkbox"/> 3-5	<input type="checkbox"/> 21-30	<input type="checkbox"/> over 50
<input type="checkbox"/> 6-10	<input type="checkbox"/> 31-40	

3. Since the introduction of Self-Service Fare collection, do you believe misuse of the fare system by riders has:

increased decreased remained about the same

4. Misuse or cheating of the fare system can occur in several ways. Since the introduction of SSFC, how often do you estimate the following types of fare misuse or cheating occur?

	Very Rarely	Rarely	Some- times	Often	Very Often
No payment at all	<input type="checkbox"/>				
Insufficient cash fare	<input type="checkbox"/>				
Not having fare for zones traveled	<input type="checkbox"/>				
Not having fare for time traveled	<input type="checkbox"/>				
Slugs, half bills, etc.	<input type="checkbox"/>				
Forged passes	<input type="checkbox"/>				
Misuse of youth, senior or disabled pass	<input type="checkbox"/>				

5. Do you believe that since the introduction of Self-Service Fare collection, *cash shortchanging* of the farebox has:

increased decreased remained about the same

6. How often do you think the following types of riders misuse the fare system?

	Very Rarely	Rarely	Some- times	Often	Very Often
Age					
Youth up to high school	<input type="checkbox"/>				
High school to age 25	<input type="checkbox"/>				
25 to 40 years	<input type="checkbox"/>				
40 to 65 years	<input type="checkbox"/>				
Over 65 years	<input type="checkbox"/>				
Time of Day					
Rush hours	<input type="checkbox"/>				
Mid-day	<input type="checkbox"/>				
Evening	<input type="checkbox"/>				
Early AM/Late PM	<input type="checkbox"/>				
Weekends	<input type="checkbox"/>				
Service Area					
Downtown	<input type="checkbox"/>				
City	<input type="checkbox"/>				
Suburban	<input type="checkbox"/>				

7. What are the hardest or easiest parts of operating the bus for you?

	Very Easy	Easy	Not Difficult	Difficult	Very Hard
Staying on schedule	<input type="checkbox"/>				
Driving in traffic	<input type="checkbox"/>				
Collecting cash fares	<input type="checkbox"/>				
Operating fare equipment	<input type="checkbox"/>				
Helping elderly or handicapped	<input type="checkbox"/>				
Dealing with students	<input type="checkbox"/>				
Handling complaints	<input type="checkbox"/>				
Dealing with overcrowding	<input type="checkbox"/>				
Dealing with fights on the bus	<input type="checkbox"/>				
Paper work (reports, trip sheets, etc.)	<input type="checkbox"/>				
Dealing with supervisors	<input type="checkbox"/>				
Other _____	<input type="checkbox"/>				

8. Based on your experience to date, do you believe the Self-Service Fare Collection system is better or worse than the fare system in use prior to September 5, 1982? (check one)

- Better About the same Worse

If "better," why?

(Check those that apply)

- More equitable fares
 Reduced cheating
 Easier for rider
 Reduced cost to Tri-Met
 Improved bus operations
 Easier for driver
 Other _____

If "worse," why?

(Check those that apply)

- Fares are too high
 Increased cheating
 Too complicated for rider
 Too expensive to Tri-Met
 Unreliable equipment
 More complicated for driver
 Other _____

9. How has the Self-Service Fare Collection system affected the time it takes for passenger boarding and alighting? (check one)

- Slower Why? _____
 Faster Why? _____
 About the same time

10. How has the Self-Service Fare Collection system affected the interaction (questions, comments) between you as the bus driver and your bus riders? (check one)

- More interaction Less interaction About the same interaction

11. How do you feel about interaction between you and your bus riders? (check one)

- Generally prefer interaction Generally do not like interaction No opinion/don't care

12. How have changes in boarding time and interaction with riders affected the overall operating speed of your bus? (check one)

- Slower Faster About the same speed

13. How have changes relating to Self-Service Fare Collection affected your performance as a bus driver? (check one)

- Easier to direct attention to driving the bus
 Harder to direct attention to driving the bus
 No change

14. How would you assess the performance of the Self-Service Fare Collection equipment? (check one for each column)

	Controller	Validator	Dispenser	Combined Performance
Excellent	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Good	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fair	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Poor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Terrible	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

15. How many times in the last week has a fare collection equipment unit failed to work on your bus? (enter "0" if none) _____

16. Of those equipment failures noted above, how many resulted in a significant delay to your bus? (i.e., 3 minutes or more off schedule) _____

17. When your bus is in revenue service, how long does it take on the average for a broken fare equipment unit to be reported by you and then fixed or replaced? (Do not include times when not in revenue service, such as pullouts)

- 0-5 minutes 10-20 minutes 30-45 minutes 60 minutes or longer
 5-10 minutes 20-30 minutes 45-60 minutes

18. Do you think drivers should collect fares manually (using transfer slip type tickets) when the fare equipment is not working?

- Yes No

19. After broken fare equipment on your bus is repaired, do you ask riders who were unable to pay their fare to deposit or validate their fares?

- Yes No

20. Are there ways the fare equipment *design* (controller buttons, ticket slots, etc.) could be improved to make operation of your bus more efficient?
 No
 Yes Explain: _____

21. Are there ways the fare equipment *placement* on the bus could be improved to make operation of your bus more efficient?
 No
 Yes Explain: _____

22. Are there ways the fare collection *procedures* could be improved to make operation of your bus more efficient?
 No
 Yes Explain: _____

23. Based on your experience over the last seven days, how many times has your bus been inspected by a fare inspector? _____
24. Do you think fares should be checked more or less often? (check one)
 More often Less often The same
25. Based on your observations of the fare inspectors, would you say they are knowledgeable and professional?
 Yes
 No Please explain: _____

26. Do you think bus drivers should "spot check" fares on low ridership trips (such as Owl Service and rural routes) in place of fare inspectors?
 Yes Why? _____
 No Why? _____
27. Briefly list up to three of the most significant problems, if any, with the Self-Service Fare Collection system:
 1. _____
 2. _____
 3. _____
28. Briefly list up to three of the most significant benefits, if any, of the Self-Service Fare Collection system:
 1. _____
 2. _____
 3. _____
29. Briefly list up to three suggestions you have to improve the fare collection system:
 1. _____
 2. _____
 3. _____
 (We welcome additional suggestions or more detail on your suggestions written on the back of this survey form.)
30. Approximately how many total operating hours did you work in the last seven days? _____
31. Are you:
 Full-time operator?
 Regular schedule Route number(s) _____, _____
 Extra board
 Mini-Run Operator? Route number(s) _____, _____

32. What is your age?

Under 30
 30-39

40-49
 50-59

60 or over

Thank you for your assistance! Please use the back of this form for additional comments regarding fares or fare collection.

PRE-SSFC ON-BOARD/MAIL-BACK SURVEY

BUS RIDERS SURVEY

IF YOU HAVE ALREADY COMPLETED THIS SURVEY, PLEASE RETURN THIS QUESTIONNAIRE TO THE SURVEYOR WITHOUT FILLING IT OUT.

The purpose of the following questions is to evaluate Tri-Met's fare collection system. Your answers will help Tri-Met understand how well the current fare system is working and whether the new fare collection system will be an improvement for riders like you.

Since you are part of a relatively small number of riders being surveyed, your answers are very important to the accuracy of this study. Tri-Met has hired an outside research firm to gather this information. You can be assured that the information you give is confidential, and will only be used in combination with the answers from other riders.

We would like you to complete the white part of the survey while on the bus and return it to the surveyor or place it in the box near the rear door. The yellow portion is to be completed as soon as possible and mailed postage free to Tri-Met.

THANK YOU FOR YOUR TIME AND HELP.

1. How many bus trips on the average do you usually take each week for each of the following trip purposes? (PLEASE COUNT EACH DIRECTION AS A SEPARATE TRIP.) (Write your answer on the line. Put "0" if none.)

_____ NUMBER OF WORK TRIPS	_____ NUMBER OF SCHOOL TRIPS
_____ NUMBER OF SHOPPING TRIPS	_____ NUMBER OF SOCIAL/RECREATION TRIPS

2. At what time do you usually ride the bus? (Circle the one number next to your answer.)

1 RUSH HOUR (7-9 a.m. & 4-6 p.m.)	3 EVENING/NIGHT (6 p.m.-7 a.m.)
2 MID-DAY (9 a.m.-4 p.m.)	4 SATURDAY OR SUNDAY

3. What bus lines do you ride most often?

NUMBER	LINE NAME
_____	_____
_____	_____
_____	_____

4. How do you usually pay your fare? (Circle the number under the proper column.)

CASH	BUS TICKET	PASS
1 \$.65 (2-zone)	1 \$.65 (2-zone)	1 \$21 (2-zone)
2 \$.90 (3-zone)	2 \$.90 (3-zone)	2 \$29 (3-zone)
3 \$.45 (Youth)	3 \$.45 (Youth)	3 \$14 (Youth)
4 \$.25 (Honored Citizen)	4 \$.25 (Honored Citizen)	4 \$ 6 (Honored Citizen)
5 \$1.00 (Vancouver)	5 \$1.00 (Vancouver)	5 \$35 (Vancouver)
6 Other	6 Other	6 Other

IF YOU USE A PASS, PLEASE SKIP TO QUESTION #7

5. How many transfer slips do you use on an average in a week? _____

6. How convenient is it to use transfer slips with 1 being "not at all convenient" and 5 being "very convenient"? (Please circle the number which corresponds to your reply.)

NOT CONVENIENT				VERY CONVENIENT
1	2	3	4	5

6a. Which of the reasons below best describes why you rated the convenience of transfer slips as you did in Question #6?

- 1 I FORGET TO ASK FOR THE TRANSFER
- 2 I LOSE THE TRANSFER OR HAVE TROUBLE FINDING IT
- 3 I DO NOT UNDERSTAND WHEN TO USE THEM
- 4 OTHER _____

(PLEASE SPECIFY)

IF YOU PAY CASH FARES, PLEASE GO TO QUESTION #8

7. Where do you usually buy your pass or bus tickets? (Circle the one number next to your answer.)

1 DRUG STORE	5 PLACE OF WORK
2 7-ELEVEN STORE	6 BY MAIL FROM TRI-MET
3 BANK OR SAVINGS & LOAN OFFICE	7 OTHER _____
4 TRI-MET CUSTOMER ASSISTANCE OFFICE	

(please complete other side)

8. How much discount do you think people should get for purchasing ten-ride tickets in advance?
- | | |
|----------------|-------------------|
| 1 NO DISCOUNT | 4 20% (or \$1.30) |
| 2 5% (or 30¢) | 5 DON'T KNOW |
| 3 10% (or 65¢) | |
9. Please circle the rating number below which best describes your opinion of the following statements regarding fare collection.
- | | STRONGLY
DISAGREE | 2 | 3 | 4 | STRONGLY
AGREE |
|---|----------------------|---|---|---|-------------------|
| a. It is a bother to have the correct change. | 1 | 2 | 3 | 4 | 5 |
| b. I don't like waiting while other people search for their fare. | 1 | 2 | 3 | 4 | 5 |
| c. The fare system is confusing because sometimes I pay when getting on and sometimes when getting off. | 1 | 2 | 3 | 4 | 5 |
| d. I'm uncertain about where zone boundaries are and when to pay the extra fare. | 1 | 2 | 3 | 4 | 5 |
| e. I'm uncertain of the boundaries of fareless square. | 1 | 2 | 3 | 4 | 5 |

9a. What other problems do you have with the method of collecting fares? (Write "none" if you have no problems.)

Tri-Met is changing its fare payment system in September. You, the rider, will be responsible for paying the correct fare when entering the bus and having proof that you did pay that fare (a pass or receipt). Inspectors will occasionally enter buses and check to see if you have paid.

10. Before now, had you seen or heard about these changes?
- | | |
|-------|------|
| 1 YES | 2 NO |
|-------|------|
- 10a. Have you heard or read about Tri-Met's Bus School?
- | | |
|-------|------|
| 1 YES | 2 NO |
|-------|------|
11. Based on the explanation above and anything else you may have heard, do you think this type of fare system would work? (Circle YES or NO.)
- | YES, BECAUSE
(Circle all that apply.) | NO, BECAUSE
(Circle all that apply.) |
|--|---|
| 1 IT WILL BE LESS CONFUSING | 1 IT WILL BE MORE CONFUSING |
| 2 MORE RIDERS WILL PAY CORRECT FARES | 2 MORE RIDERS WILL PAY INCORRECT FARES |
| 3 IT WILL BE FASTER GETTING ON BUS | 3 IT WILL TAKE LONGER TO GET ON THE BUS |
| 4 IT WILL SAVE MONEY FOR TRI-MET | 4 IT WILL COST TRI-MET MONEY |
| 5 OTHER _____
(PLEASE SPECIFY) | 5 OTHER _____
(PLEASE SPECIFY) |

THE FOLLOWING QUESTIONS ARE FOR CLASSIFICATION PURPOSES.

12. Are you:
- | | |
|--------|----------|
| 1 MALE | 2 FEMALE |
|--------|----------|
13. What is your age?
- | | |
|---------------|--------------|
| 1 15 OR UNDER | 4 45 TO 64 |
| 2 16 TO 24 | 5 65 OR OVER |
| 3 25 TO 44 | |
14. What was your approximate family income in 1981?
- | | |
|------------------------|------------------------|
| 1 UNDER \$5,000 | 4 \$15,000 TO \$24,999 |
| 2 \$5,000 TO \$9,999 | 5 \$25,000 OR OVER |
| 3 \$10,000 TO \$14,999 | |

AGAIN, THANK YOU! PLEASE TEAR OFF THE WHITE FORM AND RETURN IT TO THE PERSON WHO GAVE IT TO YOU OR PUT IT IN THE BOX NEAR THE REAR DOOR. PLEASE FILL OUT THE YELLOW FORM AT YOUR CONVENIENCE AND MAIL (POSTAGE FREE) TO TRI-MET BY JUNE 10, 1982. IN RETURN FOR YOUR HELP ON BOTH PORTIONS, TRI-MET WOULD LIKE TO SEND YOU TWO FREE BUS TICKETS. WE APPRECIATE YOUR HELP!

BUS RIDERS MAIL-BACK SURVEY

Your responses to the second portion of this survey will help us determine how well the fare collection system is working. In return for your time and cooperation, Tri-Met would like to send you two free bus tickets. Please fill out the following questions and return, free of postage, to Tri-Met by June 10, 1982. Thank you!

1. How do you usually pay your fare? (Circle the one number next to your answer.)
 - 1 CASH (PLEASE GO TO QUESTION #2.)
 - 2 BUS TICKET (PLEASE GO TO QUESTION #3.)
 - 3 BUS PASS (PLEASE GO TO QUESTION #4.)

2. Would you be more likely to buy bus tickets or passes if they were readily available from vending machines? (Circle YES or NO, then circle reasons below that answer.)

YES, BECAUSE <ol style="list-style-type: none"> 1 SOUNDS MORE CONVENIENT 2 COULD BUY THEM AT ANY TIME 3 OTHER _____ (PLEASE SPECIFY) 	NO, BECAUSE <ol style="list-style-type: none"> 1 PREFER PAYING CASH 2 HAVE A COMFORTABLE WAY OF DOING THINGS 3 DON'T TRUST VENDING MACHINES 4 OTHER _____ (PLEASE SPECIFY)
---	--

3. Why do you pay for individual rides rather than buy a monthly pass?
 - 1 DON'T RIDE THE BUS OFTEN ENOUGH TO NEED A PASS
 - 2 DIDN'T KNOW BUS PASSES WERE AVAILABLE
 - 3 PASS SALES OUTLETS ARE NOT CONVENIENT TO GET TO
 - 4 DON'T KNOW WHERE TO BUY PASSES
 - 5 PASSES ARE TOO EXPENSIVE
 - 6 OTHER _____
(PLEASE SPECIFY)

IF YOU DO NOT USE A PASS, PLEASE GO TO QUESTION #5.

4. Is showing your pass to the driver an inconvenience?
 - 1 YES IF YES, WHY? _____
 - 2 NO

5. Would you buy bus tickets or a pass from a conveniently locating vending machine if it accepted major credit cards only (such as a VISA, MasterCard, or a banking card)?
 - 1 YES
 - 2 NO IF NO, WHY NOT? _____

6. What factors should be considered in determining fares? (Circle all that apply.)
 - 1 DISTANCE OF TRIP (PAY BY THE MILE)
 - 2 TIME OF DAY (RUSH HOUR, NIGHT, WEEKEND)
 - 3 ABILITY TO PAY
 - 4 AGE (UNDER 6 YEARS, STUDENTS, ADULTS, OVER 65 YEARS)
 - 5 COST OF OPERATING THE ROUTE
 - 6 AMOUNT OF TIME FOR THE TRIP
 - 7 OTHER

7. Fares are set according to the length of trip by using fare zones. How many zones would you consider best? (Circle one choice.)
 - 1 ONE ZONE: the same fare for everyone
 - 2 TWO ZONES: for example (a) inside Portland; (b) outside Portland
 - 3 THREE ZONES: for example (a) downtown Portland; (b) inside Portland; (c) outside Portland
 - 4 FIVE ZONES: for example (a) downtown Portland; (b) inner-city; (c) outer-city; (d) suburbs (such as Beaverton or Gresham); (e) outlying areas (such as Vancouver or Forest Grove)
 - 5 SEVEN OR MORE ZONES: based on actual miles travelled

8. Based on your answer to the last question, how much do you think fares should increase for each additional zone?

1 \$.05	4 \$.20
2 \$.10	5 \$.25
3 \$.15	6 SHOULD NOT CHANGE

9. Based on your best estimate, of every 100 riders who get on the bus, how many do you think do not pay the correct fare?
 - 1 NONE (PLEASE GO TO QUESTION #12.)
 - 2 1 - 2
 - 3 3 - 5
 - 4 6 - 10
 - 5 11 - 20
 - 6 21 OR MORE

10. Of those persons who pay too little fare, why do you think they fail to pay the correct fare? (Circle all that apply.)
 - 1 THEY FORGET TO PAY
 - 2 THEY DON'T HAVE THE CORRECT CHANGE
 - 3 THEY ARE CONFUSED BY THE ZONE SYSTEM
 - 4 THEY SEE OTHERS CHEATING
 - 5 THEY THINK THE DRIVER WON'T OR CAN'T DO ANYTHING ABOUT IT
 - 6 UNHAPPY WITH SERVICE OR FARES
 - 7 OTHER _____

11. How do you think these people usually underpay their fares? (Circle all that apply.)

- 1 INSUFFICIENT FARE
- 2 BAD TRANSFER
- 3 NO PAYMENT AT ALL
- 4 WRONG USE OF 2-ZONE PASS FOR 3-ZONES OF TRAVEL
- 5 MISUSE OF YOUTH OR HONORED CITIZEN PASS
- 6 SLUGS, HALF DOLLAR BILLS, ETC.
- 7 FORGED PASS

12. What kind of penalty, if any, should there be for people who do not know they paid the wrong fare? (Circle the one number next to your answer.)

- 1 NONE
- 2 ASKED TO PAY THE CORRECT FARE
- 3 ASKED TO LEAVE THE BUS
- 4 FINED \$5.00
- 5 FINED \$20.00
- 6 FINED \$50.00
- 7 OTHER _____

13. What kind of penalty, if any, should there be for people who do not pay the correct fares on purpose? (Circle the one number next to your answer.)

- 1 NONE
- 2 ASKED TO PAY THE CORRECT FARE
- 3 ASKED TO LEAVE THE BUS
- 4 FINED \$5.00
- 5 FINED \$20.00
- 6 FINED \$50.00
- 7 OTHER _____

----- Fold Here -----

14. Are you:

- 1 MALE
- 2 FEMALE

15. What is your age?

- 1 15 OR UNDER
- 2 16 TO 24
- 3 25 TO 44
- 4 45 TO 64
- 5 65 OR OLDER

In return for your time and cooperation, Tri-Met would like to mail you two bus tickets. Please fill in your name and address below.

NAME _____

STREET ADDRESS _____

CITY _____ STATE _____ ZIP CODE _____

Tri-Met will be conducting a similar survey in ten months. Participants in the second survey will be contacted by mail or phone. In return for your time and cooperation, you would be sent five bus tickets. Would you be willing to help us in the second portion of this survey?

- 1 YES (Please include phone number.) _____
- 2 NO

THANK YOU!

----- Fold Here -----



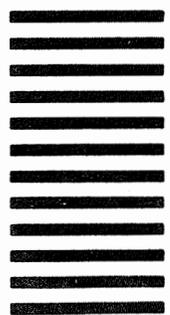
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UNITED STATES

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FIRST CLASS PERMIT NO. A-46 PORTLAND, OR

POSTAGE WILL BE PAID BY ADDRESSEE

Tri-Met Rider Survey
4012 S.E. 17th Avenue
Portland, Oregon 97202



SSFC ON-BOARD/MAIL-BACK SURVEY

BUS RIDERS SURVEY

IF YOU HAVE ALREADY COMPLETED THIS SURVEY, PLEASE RETURN THIS QUESTIONNAIRE TO THE SURVEYOR WITHOUT FILLING IT OUT.

The purpose of the following questions is to evaluate Tri-Met's new fare collection system. Your answers will help Tri-Met understand how well the new fare collection system is working for riders like you.

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We would like you to complete the white part of the survey while on the bus and return it to the surveyor or place it in the box near the rear door. The yellow portion is to be completed as soon as possible and mailed postage free to Tri-Met.

THANK YOU FOR YOUR TIME AND HELP.

1. How many bus trips on the average do you usually take each week for each of the following trip purposes? (PLEASE COUNT EACH DIRECTION AS A SEPARATE TRIP.) (Write your answer on the line. Put "0" if none.)

_____ NUMBER OF WORK TRIPS	_____ NUMBER OF SCHOOL TRIPS
_____ NUMBER OF SHOPPING TRIPS	_____ NUMBER OF SOCIAL/RECREATION TRIPS

2. At what time do you most often ride the bus? (Circle the *one* number next to your answer.)
- | | |
|--|--|
| 1 WEEKDAYS: RUSH HOUR
(7-9 a.m. & 4-6 p.m.) | 3 WEEKDAYS: EVENING/NIGHT
(6 p.m.-7 a.m.) |
| 2 WEEKDAYS: MID-DAY
(9 a.m.-4 p.m.) | 4 SATURDAY OR SUNDAY
(ALL DAY) |

3. What three bus lines do you ride most often?
NUMBER LINE NAME

4. How do you usually pay your fare? (Circle the number under the proper column.)

CASH	BUS TICKET	PASS
1 \$.75 (1- or 2-zone)	1 \$ 5.00 (1-zone)	1 \$23 (1- or 2-zone)
2 \$1.00 (3-zone)	2 \$ 6.50 (2-zone)	2 \$32 (3-zone)
3 \$1.25 (All zone)	3 \$ 9.00 (3-zone)	3 \$40 (All zone)
4 \$.50 (Youth)	4 \$11.00 (All zone)	4 \$15 (Youth)
5 \$.25 (Honored Citizen)	5 24-Hour (All zone)	5 \$ 6 (Honored Citizen)
6 Other	6 Other	6 Other

IF YOU PAY CASH FARES, PLEASE GO TO QUESTION #7

5. Where do you usually buy your pass or bus tickets? (Circle the one number next to your answer.)

1 DRUG STORE	5 PLACE OF WORK
2 7-ELEVEN STORE	6 BY MAIL FROM TRI-MET
3 BANK OR SAVINGS & LOAN OFFICE	7 SCHOOL
4 TRI-MET CUSTOMER ASSISTANCE OFFICE	8 OTHER _____ (PLEASE SPECIFY)

6. Are ticket and pass outlets more or less convenient for you than before self-service fare collection?

1 MORE CONVENIENT
2 SAME
3 LESS CONVENIENT
4 DON'T KNOW

7. How much discount, if any, do you think people should get for purchasing ten-ride tickets in advance?

1 NO DISCOUNT	4 20% (or \$1.50 on ten 2-zone rides)
2 5% (or 37¢ on ten 2-zone rides)	5 DON'T KNOW
3 10% (or 75¢ on ten 2-zone rides)	

(please complete other side)

8. Please circle the rating number below which best describes your opinion of the following statements regarding fare collection.

	STRONGLY DISAGREE		UNDECIDED		STRONGLY AGREE
a. It is a bother to have the correct change.	1	2	3	4	5
b. I don't like waiting while other people search for their fare.	1	2	3	4	5
c. I am uncertain about time limits and when I should pay extra fare.	1	2	3	4	5
d. I'm uncertain about where zone boundaries are and when I should pay extra fare.	1	2	3	4	5
e. I have trouble understanding the information printed by the machine on my ticket.	1	2	3	4	5

8a. What problems, if any, do you have with the method of collecting fares? (Write "none" if you have no problems.)

9. How many times in the last 30 days has your fare been checked by a Tri-Met Fare Inspector? _____

10. Do you think fares should be checked more or less often?

- 1 MORE OFTEN
- 2 THE SAME
- 3 LESS OFTEN
- 4 DON'T KNOW

11. Do you think more people or fewer people pay the correct fare with self-service fare than with the old method of collecting fares?

- 1 MORE PAY CORRECT FARES
- 2 THE SAME
- 3 FEWER PAY CORRECT FARES
- 4 DON'T KNOW

12. With the new equipment and rear-door boarding, is getting on and off the bus faster or slower for you than with the old fare collection system?

- 1 FASTER
- 2 THE SAME
- 3 SLOWER
- 4 DON'T KNOW

13. In general, do you find self-service fare collection more or less confusing than the old method of collecting fares?

- 1 MORE CONFUSING
- 2 THE SAME
- 3 LESS CONFUSING
- 4 DON'T KNOW

14. Overall, is the new fare collection system better or worse for you than the old fare collection system?

- 1 BETTER
- 2 THE SAME
- 3 WORSE
- 4 DON'T KNOW

15. Are you:

- 1 MALE
- 2 FEMALE

16. What is your age?

- 1 15 OR UNDER
- 2 16 TO 24
- 3 25 TO 44
- 4 45 TO 64
- 5 65 OR OVER

17. What was your approximate family income in 1982?

- 1 UNDER \$5,000
- 2 \$5,000 TO \$9,999
- 3 \$10,000 TO \$14,999
- 4 \$15,000 TO \$24,999
- 5 \$25,000 OR OVER

AGAIN, THANK YOU! PLEASE TEAR OFF THE WHITE FORM AND RETURN IT TO THE PERSON WHO GAVE IT TO YOU OR PUT IT IN THE BOX NEAR THE REAR DOOR. PLEASE FILL OUT THE YELLOW FORM AS SOON AS POSSIBLE AND MAIL (POSTAGE-FREE) TO TRI-MET. WE APPRECIATE YOUR HELP!

BUS RIDERS MAIL-BACK SURVEY

Your responses to the second portion of this survey will help us determine how well the fare collection system is working. Please fill out the following questions as soon as possible and return, free of postage, to Tri-Met. Thank you!

1. How do you usually pay your fare? (Circle the one number next to your answer.)
 - 1 CASH (PLEASE GO TO QUESTION #2.)
 - 2 BUS TICKET (PLEASE GO TO QUESTION #3.)
 - 3 BUS PASS (PLEASE GO TO QUESTION #3.)

2. Why do you pay by cash rather than buy a 10-ride ticket?
 - 1 DON'T RIDE THE BUS OFTEN ENOUGH TO TO BOTHER WITH A 10-RIDE TICKET
 - 2 DIDN'T KNOW 10-RIDE TICKETS WERE AVAILABLE
 - 3 TICKET OUTLETS ARE NOT CONVENIENT TO GET TO
 - 4 I DON'T KNOW WHERE TO BUY TICKETS
 - 5 TICKETS ARE TOO EXPENSIVE
 - 6 I LIKE USING CASH
 - 7 OTHER _____
(PLEASE SPECIFY)

3. Which of the following do you think should be considered in determining fares? (Circle all that apply.)
 - 1 DISTANCE OF TRIP (PAY BY THE MILE)
 - 2 TIME OF DAY (RUSH HOUR, NIGHT, WEEKEND)
 - 3 ABILITY TO PAY
 - 4 AGE (UNDER 6 YEARS, STUDENTS, ADULTS, OVER 65 YEARS)
 - 5 COST OF OPERATING THE ROUTE
 - 6 AMOUNT OF TIME FOR THE TRIP
 - 7 OTHER _____
(PLEASE SPECIFY)

4. Fares are set according to the distance traveled and the time it takes to make the trip. How many zones would you consider best? (Circle one choice.)
 - 1 ONE ZONE: the same fare for everyone
 - 2 TWO ZONES: for example (a) inside Portland; (b) outside Portland
 - 3 THREE ZONES: for example (a) downtown Portland; (b) inside Portland; (c) outside Portland
 - 4 FIVE ZONES: for example (a) downtown Portland; (b) inner-city; (c) outer-city; (d) suburbs (such as Beaverton or Gresham (e) outlying areas (such as Vancouver or Forest Grove)
 - 5 SEVEN OR MORE ZONES: based on actual miles and minutes traveled

5. Based on your answer to the last question, how much do you think fares should increase for each additional zone?

1 \$.05	4 \$.20
2 \$.10	5 \$.25
3 \$.15	6 SHOULD NOT CHANGE

6. Has the fare collection equipment ever failed to work properly when you were on the bus?
 - 1 YES. How many times in the last 30 days? _____
 - 2 NO
 - 3 DON'T KNOW

7. How many times in the last 30 days *did you not pay your fare* because the fare equipment did not work? (Enter 0 if this has not happened to you in the last 30 days or you use a pass) _____

8. Has non-working fare equipment caused a delay in your trip in the last 30 days?
 - 1 YES. About how long? _____ minutes
 - 2 NO

9. Based on your best estimate, of every 100 riders who get on the bus, how many do you think do not pay the correct fare?
 - 1 NONE (PLEASE GO TO QUESTION #12.)
 - 2 1 - 2
 - 3 3 - 5
 - 4 6 - 10
 - 5 11 - 20
 - 6 21 OR MORE

10. Of those persons who pay too little fare, why do you think they fail to pay the correct fare? (Circle all that apply.)
 - 1 THEY FORGET TO PAY
 - 2 THEY DON'T HAVE THE CORRECT CHANGE
 - 3 THEY ARE CONFUSED BY THE ZONE SYSTEM
 - 4 THEY SEE OTHERS CHEATING
 - 5 THEY THINK THEY WON'T BE CHECKED BY A FARE INSPECTOR
 - 6 THEY ARE DISHONEST PEOPLE
 - 7 THEY JUST DON'T HAVE THE MONEY
 - 8 THEY ARE UNHAPPY WITH SERVICE OR FARES
 - 9 OTHER _____
(PLEASE SPECIFY)

11. How do you think these people usually underpay their fares? (Circle all that apply.)
- 1 INSUFFICIENT FARE FOR NUMBER OF ZONES TRAVELED
 - 2 INSUFFICIENT FARE FOR LENGTH OF TIME TRAVELED
 - 3 NO PAYMENT AT ALL
 - 4 MISUSE OF HONORED CITIZEN OR YOUTH PASS
 - 5 SLUGS, HALF DOLLAR BILLS, ETC.
 - 6 FORGED PASS
 - 7 OTHER _____
- (PLEASE SPECIFY)
12. Which word do you think best describes a fare inspector?
- 1 FRIENDLY
 - 2 INTIMIDATING
 - 3 PROFESSIONAL
 - 4 HELPFUL
 - 5 NUISANCE
13. Overall, how well do you feel fare inspectors are doing their jobs?
- 1 GOOD
 - 2 FAIR
 - 3 POOR. Why? _____
 - 4 NO OPINION

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14. What *one* penalty should there be for people who *did not know* they paid the wrong fare? (Circle the ONE number next to your answer.)
- | | |
|---------------------------------|-----------------|
| 1 NONE | 5 FINED \$5.00 |
| 2 ASKED TO PAY THE CORRECT FARE | 6 FINED \$20.00 |
| 3 ASKED TO LEAVE THE BUS | 7 FINED \$50.00 |
| 4 ISSUED A WARNING | 8 OTHER _____ |
- (PLEASE SPECIFY)
15. What *one* penalty should there be for people who did not pay the correct fare *on purpose*? (Circle the ONE number next to your answer.)
- | | |
|---------------------------------|-----------------|
| 1 NONE | 5 FINED \$5.00 |
| 2 ASKED TO PAY THE CORRECT FARE | 6 FINED \$20.00 |
| 3 ASKED TO LEAVE THE BUS | 7 FINED \$50.00 |
| 4 ISSUED A WARNING | 8 OTHER _____ |
- (PLEASE SPECIFY)
16. Are you:
- | | |
|--------|----------|
| 1 MALE | 2 FEMALE |
|--------|----------|
17. What is your age?
- | | |
|---------------|---------------|
| 1 15 OR UNDER | 4 45 TO 64 |
| 2 16 TO 24 | 5 65 OR OLDER |
| 3 25 TO 44 | |

THANK YOU!

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Tri-Met Rider Survey
4012 S.E. 17th Avenue
Portland, Oregon 97202



SSFC PANEL SURVEY

BUS RIDERS PANEL SURVEY

1. How many bus trips on the average do you usually take each week for each of the following trip purposes (PLEASE COUNT EACH DIRECTION AS A SEPARATE TRIP.) (Write your answer on the line. Put "0" if none.)
 Number of: _____ Work Trips _____ School Trips _____ Shopping Trips _____ Social/Recreation Trips

2. At what time do you usually ride the bus? (Circle one number only)

- 1 Weekdays: Rush Hour (7-9 a.m. & 4-6 p.m.) 2 Weekdays: Mid-Day (9 a.m.-4 p.m.) 3 Weekdays: Evening/Night (6 p.m.-7 a.m.) 4 Saturday or Sunday (Anytime)

3. What three bus lines do you ride most often?

No. Line Name No. Line Name No. Line Name

4. Because of changes in the fares, do you ride the bus more or less often than a year ago?

- 1 More often ... Why? _____
 2 The same
 3 Less often ... Why? _____

5. Because of the self-service fare collection system, do you ride the bus more or less often than a year ago?

- 1 More often ... Why? _____
 2 The same
 3 Less often ... Why? _____

6. Does your usual trip take more or less time than a year ago because of the self-service fare collection system?

- 1 More time ... Why? _____
 2 The same
 3 Less time ... Why? _____

7. How do you usually pay your fare? (Circle one number only.)

Cash	Bus Ticket	Pass
1 \$.75 (1- or 2-Zone)	1 \$ 5.00 (1-Zone)	1 \$23.00 (1- or 2-Zone)
2 \$1.00 (3-Zone)	2 \$ 6.50 (2-Zone)	2 \$32.00 (3-Zone)
3 \$1.25 (All-Zone)	3 \$ 9.00 (3-Zone)	3 \$40.00 (All-Zone)
4 \$.50 (Youth)	4 \$11.00 (All-Zone)	4 \$15.00 (Youth)
5 \$.25 (Honored Citizen)	5 24-Hour (All-Zone)	5 \$ 6.00 Honored Citizen
6 Other	6 \$ 4.50 (Youth)	6 Other

IF YOU PAY CASH FARES, PLEASE GO TO QUESTION #9.

8. Where do you usually buy your pass or bus tickets? (Circle the one number next to your answer.)

- | | |
|--------------------------------------|------------------------|
| 1 Drug Store | 5 Place of Work |
| 2 7-Eleven Store | 6 By Mail from Tri-Met |
| 3 Bank or Savings & Loan Office | 7 School |
| 4 Tri-Met Customer Assistance Office | 8 Other _____ |
- (Please Specify)

9. How did you most often pay your fare a year ago? (Circle one number only.)

Cash	Bus Ticket	Pass
1 \$.65 (2-Zone)	1 \$.65 (2-Zone)	1 \$21 (2-Zone)
2 \$.90 (3-Zone)	2 \$.90 (3-Zone)	2 \$29 (3-Zone)
3 \$.45 (Youth)	3 \$.45 (Youth)	3 \$14 (Youth)
4 \$.25 (Honored Citizen)	4 \$.25 (Honored Citizen)	4 \$ 6 (Honored Citizen)
5 \$1.00 (Vancouver)	5 \$1.00 (Vancouver)	5 \$35 (Vancouver)
6 Other	6 Other	6 Other

10. How many times do you transfer in an average week? (Enter 0 if none) _____
IF YOU ANSWERED "0" GO TO QUESTION #12.

11. Is transferring easier for you now than it was a year ago?

- 1 Yes 2 No
 Why? _____

12. Do you think the way fares are set now is more fair than the way fares were set a year ago?

- 1 Yes 2 No
 Why? _____

13. Has the fare collection equipment ever failed to work properly when you were on the bus?

- 1 Yes ... How many times in the last 30 days? _____ 2 No 3 Don't know

14. When you are on the bus, does fare equipment break down more or less often now than it did last September?

- 1 More often 2 The same 3 Less often 4 Don't know

15. How many times in the last 30 days did you *not pay your fare* because the fare equipment did not work? (Enter 0 if this has not happened to you in the last 30 days or if you use a pass) _____

16. Has non-working fare equipment caused a delay in your trip in the last 30 days?

- 1 Yes ... About how long? _____ minutes 2 No

17. In your opinion, how reliable is the self-service fare equipment?

- 1 Very reliable 2 Somewhat reliable 3 Not at all reliable 4 Don't know

18. Which word do you think best describes a Fare Inspector?

- 1 Friendly 2 Intimidating 3 Professional 4 Helpful 5 Nuisance

19. How many times in the last 30 days has your fare been checked by a Tri-Met Fare Inspector? (Enter 0 if none) _____
20. In general, how well do you think Fare Inspectors are doing their job?
- 1 Good
 - 2 Fair
 - 3 Poor . . . Why? _____
 - 4 No opinion
21. Based on your best estimate, of every 100 riders who get on the bus, how many do you think do not pay the correct fare?
- 1 None
 - 2 1-2 riders
 - 3 3-5 riders
 - 4 6-10 riders
 - 5 11-20 riders
 - 6 21 or more riders
22. Do you think more people or fewer people pay the correct fare with self-service fare collection than with the old method of collecting fares?
- 1 More pay correct fares
 - 2 The same
 - 3 Fewer pay correct fares
 - 4 Don't know
23. Do you think more people or fewer people pay the correct fare now than last September?
- 1 More pay correct fares
 - 2 The same
 - 3 Fewer pay correct fares
 - 4 Don't know
24. What *one* penalty should there be for people who *did not know* they paid the wrong fare? (Circle the ONE number next to your answer.)
- | | |
|---------------------------------|-----------------|
| 1 None | 5 Fined \$ 5.00 |
| 2 Asked to pay the correct fare | 6 Fined \$20.00 |
| 3 Asked to leave the bus | 7 Fined \$50.00 |
| 4 Issued a warning | 8 Other _____ |
- (Please Specify)
25. What *one* penalty should there be for people who did not pay the correct fare *on purpose*? (Circle the ONE number next to your answer.)
- | | |
|---------------------------------|-----------------|
| 1 None | 5 Fined \$ 5.00 |
| 2 Asked to pay the correct fare | 6 Fined \$20.00 |
| 3 Asked to leave the bus | 7 Fined \$50.00 |
| 4 Issued a warning | 8 Other _____ |
- (Please Specify)
26. Currently Tri-Met issues a "surcharge fare" to persons riding the bus without a valid proof of payment. For what reasons, if any, do you think riders *should not* receive a surcharge fare? (Circle all that apply.)
- 1 Tri-Met should not issue surcharge fares
 - 2 Did not know they ran out of time or passed a zone boundary
 - 3 Forgot their pass or 10-ride ticket
 - 4 Forgot to pay or validate their 10-ride ticket
 - 5 Didn't have enough money
 - 6 Didn't notice that the ticket had the wrong time or zone on it
 - 7 Didn't notice the driver issued the wrong type of ticket
 - 8 Didn't know about self-service fare collection
 - 9 Other _____
- (Please Specify)

THE FOLLOWING QUESTIONS ARE FOR CLASSIFICATION PURPOSES:

27. Are you:
- 1 Male
 - 2 Female
28. What is your age?
- 1 15 or under
 - 2 16 to 24
 - 3 25 to 44
 - 4 45 to 64
 - 5 65 or over
29. What was your approximate family income in 1982?
- 1 Under \$5,000
 - 2 \$5,000 to \$9,999
 - 3 \$10,000 to \$14,999
 - 4 \$15,000 to \$24,999
 - 5 \$25,000 or over

Thank You! If you have any other comments on the fare collection system or fare inspection, please include them in the space provided below.

SSFC RIDER HOUSEHOLD SURVEY

1982 SELF-SERVICE FARE STUDY - AFTER IMPLEMENTATION

TRANSIT RIDER FORM

USE THIS FORM IF FILTER F2 INDICATES THAT THE RESPONDENT IS A TRANSIT RIDER
(RIDES ONE OR MORE TIMES PER AVERAGE MONTH)

QUESTION BASE

Q1. Are you aware of any changes
TRI-MET has made since the
beginning of September?

1. Yes.....(GO TO Q2)
2. No.....(GO TO Q8)

Q2. What changes are you thinking of?

(RECORD MULTIPLE MENTIONS--PROBE
FOR SPECIFIC DISTINCTIONS BETWEEN
ROUTE AND SERVICE CHANGES VS. FARE
COLLECTION CHANGES)

1. Route and schedule changes
(GO TO Q3)
2. Changes in how to pay the fare
(GO TO Q4)
3. Changes in fares and zones
(GO TO Q8)
4. Other, please specify
5. Other, please specify

Q3. Have these changes in routes or
schedules resulted in better
service, worse service or is the
service about the same for you?

1. Better
2. Worse
3. Same
4. Don't know

(IF PERSON ANSWERED Q2 WITH BOTH
#1 AND #2 AS RESPONSES, CONTINUE ON
TO Q4. IF THEY DID NOT HAVE A #2
RESPONSE, GO TO Q8)

- Q4. Is the new fare collection system a better system, worse system or about the same for you?
1. Better (ASK Q4A)
 2. Worse (ASK Q4A)
 3. Same
 4. Don't know
- Q4A. Why is that? (MARK ALL THAT APPLY)
1. Less (More) cheating
 2. Faster (Slower) boarding
 3. More (Less) equitable fares
 4. Decreased (Increased) fares
 5. Other _____
 6. Other _____
 7. Other _____
- Q5. Do you think the amount of information provided about the new way to pay your fare was not enough, too much or just about right?
1. Not enough
 2. Too much
 3. Just about right
 4. No opinion
- Q6. Do you think the information provided on the new way to pay your fare was very useful, somewhat useful or not at all useful?
1. Very useful
 2. Somewhat useful
 3. Not at all useful
 4. No opinion
- Q7. From what source or sources do you recall hearing, reading or seeing information about the changes in the fare collection system?
- (PROBE: RECORD UP TO FOUR MENTIONS
MAKE SURE TO CLARIFY IF IT IS A
NEWS STORY OR ADVERTISEMENT)

<u>TV</u>	<u>RADIO</u>	<u>NEWSPAPER</u>	<u>TRI-MET</u>	<u>OTHER</u>
Ad	Ad	Ad	Fare Inspector	Community/ Neighborhood Meeting
Story	Story	Story	Driver	
Uncertain	Uncertain	Uncertain	Bus School	Employer
			Speed Riding Manual	Personal Experience
			Riders Digest	Friend/Relative
			Other Brochure	Other _____
			Sign on Bus	Don't Recall
			Helper at Bus Stop	
			Customer Assistance Office	
			Customer Information Telephone	

- Q8. Do you recall hearing about TRI-MET'S bus school? 1. Yes
2. No.....(GO TO Q11)
- Q9. Did you attend bus school? 1. Yes
2. No.....(GO TO Q11)
- Q10. Did bus school help you understand the fare collection changes? 1. Yes
2. No
- Q10A. In what way did it help/not help you? (MARK ALL THAT APPLY) 1. Did (Didn't) provide needed information
2. Easy (Hard) to understand
3. Friendly (Unpleasant) instructor
4. Questions answered (not answered)
5. Concise (Too rushed)
6. Lots of information (Too much information)
7. Other _____
- Q11. Did you receive a TRI-MET "Speed Riding Manual"? 1. Yes
2. No.....(GO TO Q15)
- Q12. How did you receive the manual? 1. Picked up on the bus
2. Handed to me on the street
3. Mailed to me
4. At a community meeting
5. From a friend
6. Through my employer
7. Other, please specify _____
- Q13. About how much of the manual did you read? 1. All of it
2. About half of it
3. Just skimmed it
4. Didn't read it at all (GO TO Q15)
5. Don't know
- Q14. Was the manual helpful in explaining the fare collection changes? 1. Yes
2. No

- Q14A. In what way did it help (not help) you? (MARK ALL THAT APPLY)
1. Did (Didn't) provide needed information
 2. Easy (Hard) to understand
 3. Concise (Too long)
 4. Clear (Unclear) charts or tables
- Q15. Do you recall seeing a TRI-MET representative on the street providing information in early Sept.?
1. Yes
 2. No.....(GO TO Q18)
- Q16. Did you talk to this person about how to pay your fare?
1. Yes
 2. No.....(GO TO Q18)
- Q17. Was the person helpful in explaining how to pay your fare?
1. Yes.....(GO TO Q18)
 2. No.....(GO TO Q17A)
- Q17A. Why was this person not helpful? (MARK ALL THAT APPLY)
1. Didn't know the answer
 2. Was in a hurry
 3. Provided incorrect information
 4. Other _____
 5. Other _____
 6. Other _____
- Q18. Have you heard of TRI-MET fare inspectors?
1. Yes
 2. No.....(GO TO Q24)
- Q19. Has your fare ever been checked by a fare inspector?
1. Yes
 2. No
- Q20. Have you ever asked a fare inspector questions about how to pay your fare while on the bus?
1. Yes
 2. No.....(GO TO Q21)
- Q20A. Was the fare inspector helpful or not helpful in answering your question(s)?
1. Helpful
 2. Not helpful.....(GO TO Q21)
- Q20B. Why was the fare inspector not helpful? (MARK ALL THAT APPLY)
1. Didn't answer question
 2. Was rude or unfriendly
 3. Answer was confusing
 4. Other _____

Q21. Which of the following five attributes best describes a fare inspector?

(READ AND ROTATE LIST)
MARK ROTATION

1. Threatening
2. Friendly
3. Professional
4. Helpful
5. Nuisance

Q21A. Which attribute least describes a fare inspector?

(READ LIST AS BEFORE EXCLUDING ANSWER GIVEN IN PREVIOUS QUESTION)

1. Threatening
2. Friendly
3. Professional
4. Helpful
5. Nuisance

Q22. Now, which one of the following five professions best describes a fare inspector?

(READ AND ROTATE LIST)
MARK ROTATION

1. Policeman
2. Conductor
3. Bus driver
4. Information person
5. Security guard

Q22A. Which least describes a fare inspector?

(READ LIST AS BEFORE EXCLUDING ANSWER GIVEN IN PREVIOUS QUESTION)

1. Policeman
2. Conductor
3. Bus driver
4. Information person
5. Security guard

Q23. Do you think fare inspectors should check fares more or less often than they do now?

1. More
2. Less
3. Don't know

Q24. Do you think the amount of cheating on fares has increased, decreased or remained the same since before September?

1. Increased
2. Decreased
3. Same
4. Don't know

Q25. About how many times in September have you ridden TRI-MET for the following purposes? Count each trip as two times.

READ LIST

- a. Shopping _____
- b. Work _____
- c. School _____
- d. Business or personal appointments _____
- e. Social/recreational trips _____

Q25A. Are you riding more, less or about the same since before the September changes?

- 1. More(ASK Q25B)
- 2. Less.....(ASK Q25B)
- 3. Same.....(GO TO Q26)

Q25B. Why are you riding more (less)?

- 1. Better (Worse) service or schedule
- 2. Working more (fewer) days
- 3. Cheaper (More expensive) fares
- 4. Easier (Harder) to ride with new system
- 5. Student in class now
- 6. Other _____

Q26. Which of the following categories best describes the time of day when you usually ride the bus?

- 1. Rush hour (7-9 am or 4-6 pm)
- 2. Evening (6 pm to 7 pm)
- 3. Midday (9 am to 4 pm)
- 4. Weekends (Saturday or Sunday)

Q27. What type of fare did you pay in August?

(MAKE SURE YOU CAN DELINEATE BETWEEN TICKET, CASH AND PASS FOR THEIR RESPONSE)

Cash or Ticket

- 1. \$.65 (2-zone)
- 2. \$.90 (3-zone)
- 3. \$1.00 (Vancouver)
- 4. \$.10 (Honored Citizen)
- 5. \$.45 (Student)
- 6. \$.15 (Disabled)

Pass

- 7. \$21. monthly (2-zone)
- 8. \$29. monthly (3-zone)
- 9. \$35. monthly (Vancouver)
- 10. \$14. (Student)]
- 11. Multnomah County employee
- 12. Tri-Met employee

Free

- 13. Fareless Square
- 14. Free honored citizen

Q28. What type of fare do you pay now?

(MAKE SURE YOU CAN DELINEATE BETWEEN TICKET, CASH AND PASS FOR THEIR RESPONSE)

Cash

1. \$.75 (1-or 2-zone)
2. \$1.00 (3-zone)
3. \$1.25 (4-or 5-zone)
4. \$.50 (Student)
5. \$.25 (Honored citizen)

10-Ride Ticket

6. \$2.50 (24-hour)
7. \$4.50 (Youth)
8. \$5.00 (Short hopper)
9. \$6.50 (2-zone)
10. \$9.00 (3-zone)
11. \$11.50 (All-zone)

Monthly Pass

12. \$6.00 (Honored citizen)
13. \$15. (Youth)
14. \$23. (2-zone)
15. \$32. (3-zone)
16. \$40. (All-zone)

Q29. Would you use a ticket or pass vending machine if they were located at key locations (Transit Mall, transit centers, shopping centers)?

1. Yes
2. No.....(GO TO Q30)

Q29A. Would you be more likely to buy a 10-ride ticket or a monthly pass from such a vending machine?

1. 10-ride ticket
2. Pass
3. Don't know

Q29B. Would you prefer to use cash or a major credit card in such a vending machine (VISA, Mastercard, American Express)?

1. Cash
2. Credit card
3. Other _____
4. Don't know

Q30. Are you very confident, somewhat confident, or not at all confident that you know how to pay your fare today?

1. Very confident
2. Somewhat confident
3. Not at all confident
4. No opinion

- Q31. How about last August?
1. Very confident
 2. Somewhat confident
 3. Not at all confident
 4. No opinion
- Q32. Overall, do you feel TRI-MET is doing an excellent, good, fair or poor job?
1. Excellent
 2. Good
 3. Fair
 4. Poor
 5. Don't know
- Q33. What is your age, please?
- | | |
|----------------|------------|
| 1. 15 or under | 4. 45 - 64 |
| 2. 16 - 24 | 5. 65 + |
| 3. 25 - 44 | 6. Refused |
- Q34. What part of the Metropolitan area do you live in?
- | | |
|-------------------|--|
| a. North Portland | g. Western suburbs (Beaverton, Tigard, etc.) |
| b. Northeast | h. Southern suburbs-west of river (West Linn, Lake Oswego, etc.) |
| c. Southeast | i. Southern suburbs-east of river (Milwaukie, Oregon City, etc.) |
| d. Northwest | j. East Multnomah County |
| e. Southwest | k. Other _____ |
| f. Downtown | |
- Q35. Which of the following categories best describes your household income for 1981?
- (READ LIST ROUNDING 000's)
1. Under \$15,000
 2. \$15,000 - \$19,999
 3. \$20,000 - \$24,999
 4. \$25,000 - \$34,999
 5. \$35,000 and over
 6. Refused
- Q36. Record sex.
1. Male
 2. Female

THANK YOU FOR YOUR COOPERATION !!!!

SSFC NON-RIDER HOUSEHOLD SURVEY

1982 SELF- SERVICE FARE STUDY
(AFTER IMPLEMENTATION)

INTRODUCTION

HELLO, MY NAME IS _____ FROM MARKET DECISIONS CORP.
WE ARE CONDUCTING A STUDY OF TRANSIT SERVICE WITHIN THE PORTLAND AREA AND WOULD
LIKE TO INCLUDE YOUR OPINION.

FILTERS

- F1. First, are you at least 14 years of age and currently living at this residence?
1. Yes.....(If yes, continue on to F2)
2. No.....(If no, ask to speak to someone in the household who is at least 14 and currently residing there. If no one is available, terminate interview.
- F2. How many times do you normally ride TRI-MET in an average month?
1. Never ride bus (NON-RIDER)
(Continue with Q1)
2. One or more times (RIDER)
(Continue with YELLOW RIDER FORM)

QUESTION BASE -- NON-TRANSIT RIDER

- Q1. Are you aware of any changes TRI-MET has made since the beginning of September?
1. Yes.....(GO TO Q2)
2. No.....(GO TO Q8)
- Q2. What changes are you thinking of? (RECORD MULTIPLE MENTIONS--PROBE FOR SPECIFIC DISTINCTIONS)
1. Route and schedule changes
(GO TO Q3)
2. Changes in how to pay the fare (GO TO Q4)
3. Changes in fares and zones
(GO TO Q8)
4. Other, please specify
(GO TO Q8)
5. Other, please specify
(GO TO Q8)

Q3. If you were to ride the bus, would these changes in routes or schedules result in better service, worse service or would the service be about the same for you?

1. Better
2. Worse
3. Same
4. Don't know

(IF PERSON ANSWERED Q2 WITH BOTH #1 AND #2 AS RESPONSES CONTINUE ON TO Q4. IF THEY DID NOT HAVE A #2 RESPONSE, GO TO Q8)

Q4. From what you have heard, do you think the new way to pay your fare is better, worse or about the same?

1. Better.....(ASK Q4A)
2. Worse.....(ASK Q4A)
3. Same
4. Don't know

Q4A. Why? (MARK ALL THAT APPLY)

1. Less (More) cheating
2. Faster (Slower) boarding
3. More (Less) equitable fares
4. Decreased (Increased) fares
5. Other _____
6. Other _____
7. Other _____

Q5. Do you think the amount of information provided about the new way to pay your fare was not enough, too much or just about right?

1. Not enough
2. Too much
3. Just about right
4. No opinion

Q6. Do you think the information provided on the new way to pay your fare was very useful, somewhat useful or not at all useful?

1. Very useful
2. Somewhat useful
3. Not at all useful
4. No opinion

Q7. From what sources do you recall hearing, reading or seeing information about the changes in the fare collection system?

(PROBE: RECORD UP TO FOUR MENTIONS -- MAKE SURE TO CLARIFY IF IT IS A NEWS STORY OR ADVERTISEMENT)

TV	RADIO	NEWSPAPER	TRI-MET	OTHER
Ad Story Uncertain	Ad Story Uncertain	Ad Story Uncertain	Fare Inspector Driver Bus School Speed Riding Manual Riders Digest Other Brochure Sign on Bus Helper at Bus Stop Customer Assistance Office Customer Information Telephone	Community/ Neighborhood meeting Employer Personal experience Friend/relative Other _____ Don't recall _____

Q8. Do you recall hearing about TRI-MET's bus school?

1. Yes
2. No.....(GO TO Q11)

Q9. Did you attend bus school?

1. Yes
2. No.....(GO TO Q11)

Q10. Did bus school help you understand the fare collection changes?

1. Yes
2. No

Q10A. In what way did it help (not help) you? (MARK ALL THAT APPLY)

1. Did (Didn't) provide needed information
2. Easy (Hard) to understand
3. Friendly (Unpleasant) instructors
4. Questions answered (not answered)
5. Concise (Too rushed)
6. Lots of information (Too much information)
7. Other _____

Q11. Did you receive a TRI-MET "Speed Riding Manual"?

1. Yes
2. No.....(GO TO Q15)

Q12. How did you receive the manual?

1. Picked up on the bus
 2. Handed to me on the street
 3. Mailed to me
 4. At a community meeting
 5. From a friend
 6. Through my employer
 7. Other, please specify
-

Q13. About how much of the manual did you read?

1. All of it
2. About half of it
3. Just skimmed it
4. Didn't read at all
(GO TO Q15)
5. Don't know

Q14. Was the manual helpful in explaining the fare collection changes?

1. Yes
2. No

Q14A. In what way did it help (not help) you? (MARK ALL THAT APPLY)

1. Did (Didn't) provide needed information
2. Easy (Hard) to understand
3. Concise (Too long)
4. Clear (Unclear) charts or tables
5. Other _____

Q15. Do you recall seeing a TRI-MET representative on the street providing information in early September?

1. Yes
2. No

Q16. Have you heard of TRI-MET fare inspectors?

1. Yes
2. No.....(GO TO Q19)

Q17. Based on what you have heard, which of the following five attributes best describes a fare inspector?

(READ AND ROTATE LIST)
MARK ROTATION

1. Threatening
2. Friendly
3. Professional
4. Helpful
5. Nuisance
6. No opinion (SKIP TO Q19)

Q17A. Which attribute least describes a fare inspector?

(READ LIST AS BEFORE EXCLUDING ANSWER GIVEN IN PREVIOUS QUESTION)

1. Threatening
2. Friendly
3. Professional
4. Helpful
5. Nuisance
6. No opinion

Q18. Now, which one of the following five professions do you think best describes a fare inspector?

(READ AND ROTATE LIST)
MARK ROTATION

1. Policeman
2. Conductor
3. Bus driver
4. Information person
5. Security guard
6. No opinion (SKIP TO Q19)

Q18A. Which least describes a fare inspector?

(READ LIST AS BEFORE EXCLUDING ANSWER GIVEN IN PREVIOUS QUESTION)

1. Policeman
2. Conductor
3. Bus driver
4. Information person
5. Security guard

Q19. If you were to ride the bus today, would you be very confident, somewhat confident or not at all confident that you would know how to pay your fare?

1. Very confident
2. Somewhat confident
3. Not at all confident
4. No opinion

Q20. How about last August?

1. Very confident
2. Somewhat confident
3. Not at all confident
4. No opinion

Q21. What is your age, please?

1. 15 or under
2. 16 - 24
3. 25 - 44
4. 45 - 64
5. 65 +
6. Refused

Q22. What part of the Metropolitan area do you live in?

- a. North Portland
- b. Northeast
- c. Southeast
- d. Northwest
- e. Southwest
- f. Downtown
- g. Western suburbs (Beaverton, Tigard, etc.)
- h. Southern suburbs - west of river (West Linn, Lake Oswego, etc.)
- i. Southern suburbs - east of river (Milwaukie, Oregon City, etc.)
- j. East Multnomah County
- k. Other _____

Q23. Which of the following categories best describes your household income for 1981?

(READ LIST, ROUNDING 000'S)

- 1. Under \$15,000
- 2. \$15,000 - \$19,999
- 3. \$20,000 - \$24,999
- 4. \$25,000 - \$34,999
- 5. \$35,000 and over
- 6. Refused

Q24. Record sex.

- 1. Male
- 2. Female

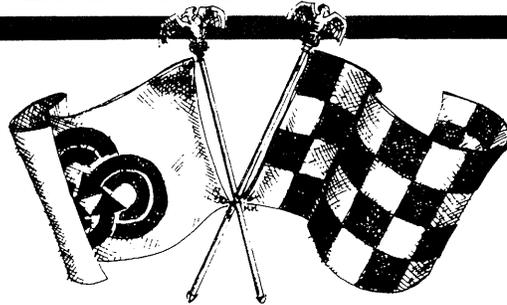
THANK YOU FOR YOUR COOPERATION !!!

APPENDIX B
SELECTED PAGES FROM SPEED RIDING MANUAL



SPEED RIDING MANUAL

THE HOW, WHEN AND WHERE OF
RIDING AMERICA'S FASTEST BUSES.



Featuring:

-
- *Rapid Self-Service Fare Equipment*
 - *Handy New Tickets and Passes*
 - *Streamlined Dual-Door Boarding*
 - *Easy Transferring*
 - *Quick and Courteous Fare Inspectors*
 - *More Equitable 5-Zone System*
-
- *And last, but hardly least, Faster, More Direct Routes that Skip Downtown.*

THANKS TO A UNIQUE SELF-SERVICE BOARDING SYSTEM AND GREATLY IMPROVED SERVICE, PORTLAND WILL SOON HAVE AMERICA'S FASTEST BUSES.

IT ALL STARTS SEPTEMBER 5. WILL YOU BE UP TO SPEED?

Attention all bus riders. Whether you take Tri-Met twice a day, or twice a year, the rules are going to change Sunday, September 5.

No need to panic. The changes are easy to understand and simple to learn. Just look over this "Speed Riding Manual" closely and it should answer 99% of your questions. (For any left unanswered, get our new Transportation Guide and Map. See page 13 of this Manual for details.)

Incidentally, the most common question we get is "Why monkey with the current system? Doesn't it work fine the way it is?"

Well, yes and no. Compared to many cities, Portland's transit system is already exceptionally efficient. But there are some weak points that needed solving. Like a fare system that isn't totally fair. And a ticketing system that wouldn't work well with the coming light rail service. And a route system that is often too infrequent and too roundabout.

So change things we must.

But all for the better. The end result will be to keep ourselves running lean and efficient so, in turn, we can keep future fare increases to a minimum.

And service to our riders at a maximum.

So prepare for September 5.

Your part of the bargain is to find out how these improvements affect your particular trip(s) *before* you board. It's really pretty simple. Just follow these steps as you read the following pages:

1. Check out how the new self-service ticketing machines work.
2. Determine how many zones your trip(s) will cover, then...
3. Figure out which kind of ticket or pass you want to buy...
4. Double-check your route number with the chart on page 7 for any changes as well as possible other new service in your area.
5. Look at the Frequency Table on page 12 for service intervals.
6. Purchase a Tri-Met Transportation Guide and Map after August 20 if you need a specific timetable or the system map.

Once you've got it down, you'll find riding Tri-Met buses will be easier, more convenient and... faster. At peak load hours we should be able to trim considerable time off boarding intervals within the first month.

Eventually, when everyone gets up to speed on the improvements, we hope to actually shave time off of many routes. Not by driving faster, but by handling passengers faster.

So come on Portland.

Though it's nothing new in Europe, self-service boarding on buses makes its debut in the United States on September 5. Right here in Oregon. Let's show them how it's done.

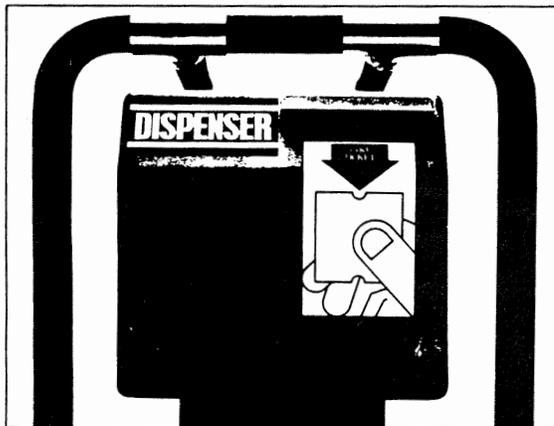


HOW TO WORK OUR SPEED EQUIPMENT.

JUST THE TICKET FOR QUICKER BOARDING, QUICKER TRANSFERRING.

Think how much swifter everyone could get on (and off) a bus if they all didn't have to file through the front door and deal with the driver.

That's the idea behind self-service boarding. Just as self-service has been saving people time in laundromats, supermarkets and department stores, it can also save you time in buses.



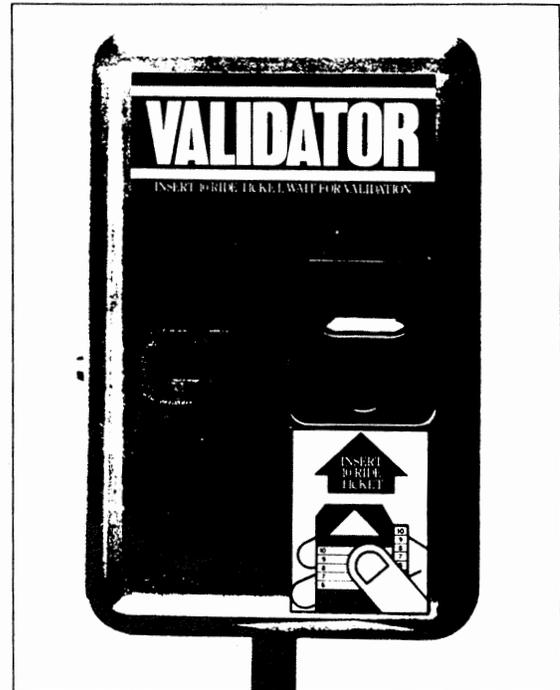
For cash-paying customers, this machine is the one to look for. It will give you a new ticket each time you pay.

At the heart of our system are two orange electric boxes on every bus. One is called a ticket Dispenser, one a ticket Validator. (By the way, if you plan to use a Monthly Pass, you can jump ahead to the next page. These machines are for ticket-users only.)

We'll tell you all about the types of tickets on the next page, but for now, let's concentrate on these two machines.

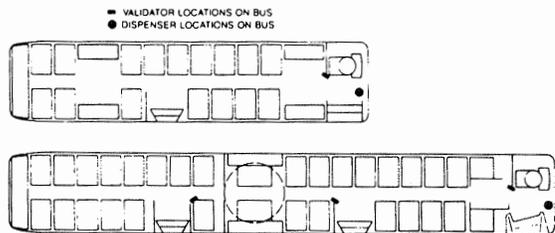
First, the Dispenser. It is for riders who like to use exact change each time and pay with cash. If that's you, after September 5 you'll drop the exact amount into the farebox as usual, then tell the driver your zones of travel. He'll press a couple of buttons on his "black box" and the Dispenser will instantly issue you a dated, timed and zone-imprinted single ride ticket. Which you should hang on to, for this is your proof of payment.

The other box is called a Validator. It's for passengers who prefer to use our new pre-paid 10-Ride Tickets. Just climb aboard and push the ticket into the Validator's slot. In all of about one second it will imprint the date, time and zone and take a "bite" out of the ticket. Then you can go ahead and sit down.



For 10-Ride Ticket holders, this machine is yours. Insert ticket and zap, bam, you're set.

And that's about it. There will be a Dispenser and Validator inside, up front on all buses. In addition, there will be Validators *inside all doors* on the articulated buses. That means 10-Ride Ticket holders can board any door on the artic! Which should speed things up for everyone.



Right now there are Dispensers in the front of all buses. Validators are in the front of all buses and also inside rear doors of articulated buses.

And once you've got a validated ticket (whether single ride or 10-Ride) that becomes your transfer, too. So, as long as you don't exceed your time limit, if you change buses you can board any door.

Now you see why we call it speed equipment.

THREE WAYS TO PAY: FAST, FASTER, FASTEST.

CASH, 10-RIDE TICKETS AND MONTHLY PASSES. (PLUS A COUPLE OF OTHER PLEASANT SURPRISES.)

While these are the same three basic ways people have been paying their Tri-Met fares, each has some interesting improvements.

Cash fares, for example, are paid the same way (exact amount dropped into farebox) but then the single ride ticket comes out of the ticket Dispenser. Riders should hold on to this ticket as it has date, time and zone imprinted on it. This ticket serves as the passenger's transfer and as proof of payment. (You'll learn about this in a minute.)



Now when you pay cash, you get one of these. Note the time is imprinted in consecutive numbers, from 1 (AM) to 24 (PM) hours. So 18:45 is really 6:45 PM. (Just deduct 12 hours after noon.)

And we still offer a way of pre-purchasing ten trips, but instead of the cumbersome ticket coupon booklets, you can now get ten rides on one handy ticket.* We call it, appropriately enough, the 10-Ride Ticket. There are five versions of it, depending on your zones and your age. (See Fare/Zone Table on next page.)

As we've said, riders insert these tickets into the Validator upon starting their trip. The Validator will imprint date, time and zone on it and take a nick out of the numbering system along the side, to indicate how many rides are left on this particular ticket.

Only one caution here. Don't bend or damage these tickets. Keep them straight. Otherwise the Validator may not be able to validate them.

What is completely new is our Short Hopper Ticket. It's good for ten rides within any one zone. And at only \$5.00, it's a true bargain.



There are five kinds of 10-Ride Tickets in all. Each is good for different zones and different time limits. Check the table on the next page for details. Honored Citizens please note that if you are on the bus during peak hours (7 to 9 AM and 4 to 6 PM) on weekdays, you must pay full adult fare, though your Honored Citizen Pass is good for a 25% discount towards these rates.

One way to by-pass all tickets and machinery is to buy a pass. These "month-long tickets" give you unlimited travel within the designated zones you pick (see box on next page). All you do is buy your pass and punch out the zone grouping on the front that you choose to travel. Leave all others intact or your pass will be invalid. You can now board any bus, any door, without messing with tickets, machines or drivers.



There are different passes for different zones and ages. If you travel Tri-Met more than 32 times a month, a pass will save you considerable money and time. Just board any door, any bus, without even showing the driver your pass. See Fare/Zone Table on next page for prices, etc.

All these tickets and passes also do something else. They are proof that you have paid your fair share and are traveling within the right zones and the right time limits.

That's fortunate because there will be some new Tri-Met people whose job it is to see that everybody is playing by the rules. They're called Fare Inspectors.



You never know when a Fare Inspector will pop on board and ask to see everyone's proof of payment.

These men and women will board buses randomly and ask passengers to please show proof of payment. In other words, either a valid single ride ticket, a valid 10-Ride Ticket or a valid pass. That's all.

For those who try to sneak a free ride now and then, the odds aren't too good. Especially since they can be tabbed with a \$20 surcharge fare. Besides, it's more than a little embarrassing to be nabbed in front of a busload of paying passengers.

So be sure your ticket or pass is valid and be sure you keep it with you at all times. (While riding the bus, that is.)

Current 45, 65* and 90* single tickets will be accepted as pre-paid fare. After September 5, you may trade in a full book of ten tickets for a new 10-Ride Ticket at Tri-Met's Customer Assistance Office, 522 SW Yamhill in downtown Portland. (Books of 25* tickets will continue to be available for Honored Citizens after September 5.)

NEW ZONES MAKE FOR MORE FAIR FARES.

NOW HOW MUCH YOU PAY IS MORE CLOSELY RELATED TO HOW FAR YOU TRAVEL.

Whether you plan to board with cash, a 10-Ride Ticket or a Monthly Pass, you'll need to know something first: how many zones your trip(s) will take you into. The more zones, the more you'll pay.

See, in the past, some riders who traveled short distances had to pay the same as riders traveling much farther. Which wasn't too fair.

While it's impossible to have a pay-by-the-mile system, our new 5-Zone plan does make things more equitable by allowing riders to come closer to paying for the distance they travel.

As this Fare/Zone Table shows, an All-Zone Ticket or Pass costs more than a 3-Zone, a 3-Zone costs more than a 2-Zone, etc. Study this table closely because it has lots of information—not only fares, but time limits for each ticket. In other words, a 3-Zone Ticket has a two hour time limit, per validation. This means you could ride through those three zones for two hours without having to insert the ticket into a Validator again. Even if you change buses. Conceivably, this could result in a round trip or more for the price of one! The only constraint is you don't ride for more than two hours.

	CASH	10-RIDE TICKET	VALID AS TRANSFER	MONTHLY PASS
Adult All-Zones	\$1.25	\$11.50	2½ hours	\$40.00
Adult 3-Zone	1.00	9.00	2 hours	32.00
Adult 2-Zone (1 or 2 zones)	.75	6.50	1½ hours	23.00
Short Hopper				
1-Zone	None	5.00	1 hour	None
24-Hour All-Zones (unlimited rides)	None	2.50	24 hours	None
Youth All-Zones	.50	4.50	2½ hours	15.00
Retarded Citizen (all hours; all zones)	.25	None	2½ hours	6.00
Honored Citizen	Same as "Adult" fare (weekdays 7-9 am, 4-6 pm)			
Honored Citizen (all other hours; all zones)	.25	None	2½ hours	6.00

2-ZONE 10-RIDE TICKET plus 25¢ will permit travel within three zones, or the same ticket plus 50¢ will permit travel anywhere. 3-ZONE 10-RIDE TICKET plus 25¢ will permit travel anywhere.
2-ZONE MONTHLY PASS holders may travel within three zones upon payment of an additional 25¢ or may travel anywhere within the system upon payment of an additional 50¢. 3-ZONE Monthly Pass holders may travel anywhere on any regularly scheduled route upon payment of 25¢.
RETARDED CITIZENS must obtain a STAR card from Clackamas, Multnomah or Washington County Association for Retarded Citizens.
HONORED CITIZENS must have proof of payment of adult fare with them during peak hours. The Honored Citizen Monthly Pass will count 25¢ toward the full adult fare. 10-Ride Tickets for Honored Citizens are available for regular adult fares. Books of 25¢ tickets are still available for Honored Citizens.

Here's a wealth of info in one handy table. Once you know how many zones your trip is, choose how you want to pay. Note the savings of 10-Ride Tickets over cash fares, and the even greater savings of passes. Also note time limits for each.

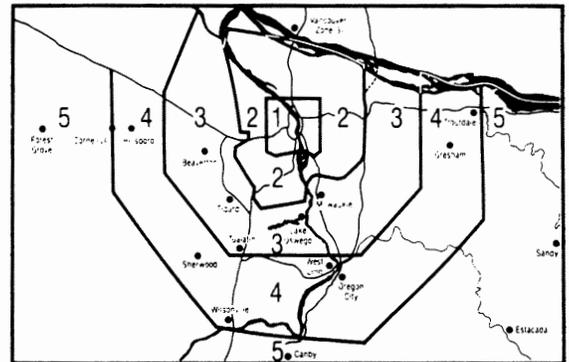
To figure out how many zones your trip(s) will be, find the beginning and end points of your route on this map. Then just count how many zones you'll travel through. (Also, check the more detailed zone description table, page 11.)

For example, a trip that starts in Gresham and goes to downtown passes from zone 4, to 3, to 2, to 1. That's a 4-zone trip so these passengers would buy either an All-Zone 10-Ride Ticket or an All-Zone Pass, or pay a cash fare amount of \$1.25 per ride.

Here's something you'll like. Passengers can cross through downtown and come out the other side without incurring additional zone charges. Another example is needed: Say you travel from Beaverton (zone 3) through zone 2 and into zone 1 to go to work. That's a 3-zone trip. Well, you could use your same 3-Zone Ticket or Pass to also continue on out of zone 1 east, into zone 2 or even 3. Say, to go shopping at Gateway shopping center. So the new zone system can work very much to your advantage.

For trips within one zone, you will be able to buy a special Short Hopper 10-Ride Ticket. Cash fare for one or two zones is 75¢. There is no one zone monthly pass.

All rides are free within Fareless Square bounded by Hoyt St. on the north, the Willamette River on the east, and the Stadium Freeway on the south and west. There is no time restriction.



Here are the five new zones of Tri-Met. Count how many zones your trip(s) will be before you buy your tickets or passes. If you need more detail than this, pick up our new Transportation Guide and Map. (See page 13 for more details.)

NOW MEET SOME FASTER, MORE DIRECT ROUTES.

THE SHORTEST DISTANCE BETWEEN TWO POINTS COULD BE A TRI-MET LINE.

So far, we've been dealing with improvements that affect the entire Tri-Met system. Now let's concentrate on specific areas that have been much in need of help. The east side of the river, north and northwest Portland.

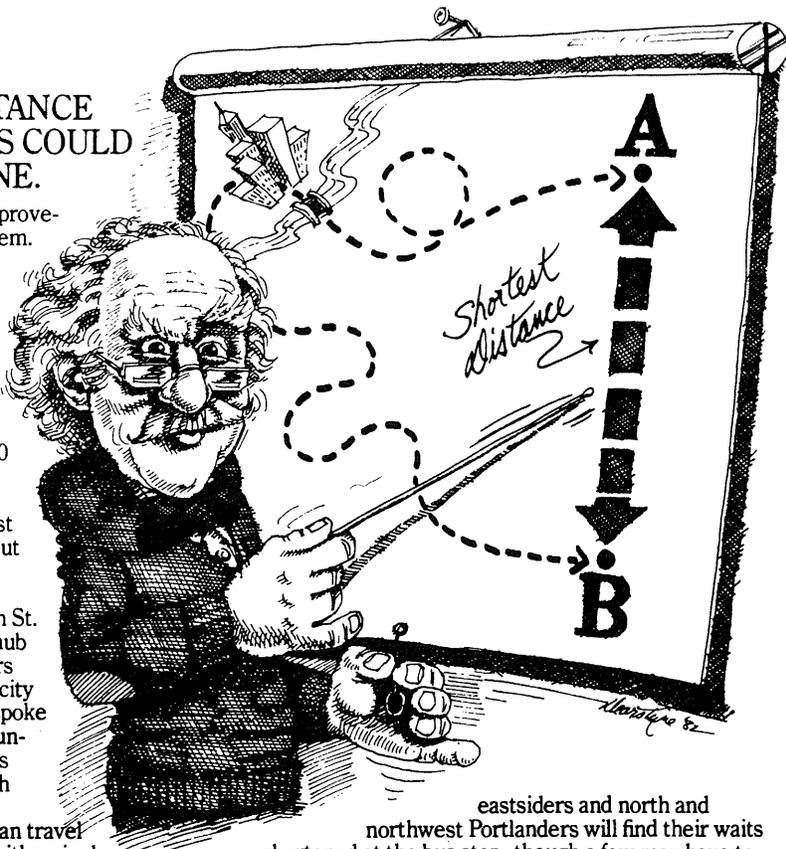
If you live, work or travel here, we've got great news for you. (If you don't, feel free to skip to the next page.)

As of September 5, service in these areas will be increased by some 400 bus hours *per day!* What's more, many routes have been re-aligned and streamlined so you can now travel across the east side, north and northwest Portland without having to swing downtown at all. Hurray, right?

Say you want to go from downtown St. Johns to Jantzen Beach. Due to the old "hub and spoke" type route pattern, passengers have either had to travel first to the hub (city center), then out to Jantzen Beach via a spoke route, or transfer twice on infrequently running routes. No more. The new system is more of a "grid" pattern, with added north and south routes.

Let's look at a few examples: You can travel quickly from St. Johns to Jantzen Beach with a single transfer between routes that run very frequently. Or from Laurelhurst and Montavilla neighborhoods to the Civic Stadium. Or from the Emanuel Hospital area to Gateway and Lloyd Center. These latter two, both direct, no-transfer trips.

And thanks to the increased number of buses,



eastiders and north and northwest Portlanders will find their waits shortened at the bus stop, though a few may have to transfer where they didn't before.

For details of route changes, check the next three pages and the map on page 10. If you've been Tri-Metting it on the east side, north or northwest Portland before, chances are you're going to love these improvements. If you haven't tried Tri-Met in these areas, now's the time.

APPENDIX C
AMENDED FARE EVASION ORDINANCE

ORDINANCE NO. 93

AN ORDINANCE REQUIRING PROOF
OF FARE PAYMENT BY PASSENGERS AND
ESTABLISHING A SURCHARGE FARE
AMENDING AND RESTATING Ordinance No. 93

THE BOARD OF DIRECTORS OF THE TRI-COUNTY METROPOLITAN
TRANSPORTATION DISTRICT OF OREGON (Tri-Met), under authority
of Oregon Revised Statutes Chapter 267, finds:

- A. That a system of self-service fare payment will create substantial cost savings to the residents and taxpayers of Tri-Met and to the users of its transportation facilities; and
- B. That a self-service system will contribute to a more efficient and more convenient transportation service, both for drivers and for passengers, and
- C. That in order to establish a viable self-service system it is necessary to adopt incentives and disincentives to encourage Tri-Met passengers to pay the required fares and to carry proof of payment while occupying Tri-Met vehicles.

THE BOARD THEREFORE ORDAINS AND DECREES AS FOLLOWS:

Section I: DEFINITIONS

- A. Inspector: Means a person authorized by the General Manager to demand proof of fare payment from persons occupying Tri-Met vehicles.
- B. Proof of Fare Payment: means any of the following:
 - 1) A Tri-Met pass or a C-Tran (Clark County Public Transportation Benefit Area Authority) pass valid for the status of person, the time of use and the zones of travel, or
 - 2) A receipt showing payment of the applicable fare, used within the time and zones applicable to the receipt, or
 - 3) A prepaid ticket or series of tickets showing cancellation by Tri-Met time stamp, used within the time and zones applicable to the ticket; or
 - 4) A copy of a Notice and Demand for Surcharge Fare Payment issued for the date of the violation and used within the period of

validity of the Notice, which shall be 2½ hours.

Section II: PROHIBITIONS

- A. It shall be unlawful for any person to occupy, ride in or use, any Tri-Met vehicle without paying the applicable fare.
- B. It shall be unlawful for any person to occupy, ride in or use, any Tri-Met vehicle without carrying Proof of Fare Payment.
- C. It shall be unlawful for any person occupying a Tri-Met vehicle to fail to exhibit Proof of Fare Payment upon demand of an Inspector.
- D. It shall be unlawful for any person to fail to provide his or her name, address or identification to an Inspector as required by Section III B of this Ordinance.
- E. It shall be unlawful for any person, required by Section III B of this Ordinance to provide his or her name, address or identification, to provide a false name, address or identification.

Section III: NOTICE AND DEMAND FOR SURCHARGE FARE PAYMENT

- A. In addition to any penalty provided by Section VI of this ordinance if a person fails to exhibit Proof of Fare Payment upon demand by an Inspector, the person shall be liable for a surcharge fare of \$20.
- B. A person failing to exhibit Proof of Fare Payment upon demand by an Inspector shall provide to the Inspector his or her name and residence address and shall exhibit upon request of the Inspector whatever written identification, if any, may be carried by the person.
- C. The Inspector shall deliver to any person who fails to exhibit Proof of Fare Payment a Notice and Demand for Surcharge Fare Payment. The Notice and Demand may be in such form as the General Manager may determine from time to time; but the Notice and Demand shall contain, at a minimum, the following information: the name and address of the person, the date, the time of day, and the route number of the vehicle which the person occupied without

exhibiting Proof of Fare Payment, and a notice that the surcharge fare must be paid in person or by mail to Tri-Met within 20 days at locations determined by the General Manager.

In the event a Notice and Demand for Surcharge Fare Payment shall be delivered to an unemancipated minor, over the age of 6, the parents, (or if no parent has custody, the guardian having custody of the minor) shall be equally liable for the surcharge fare and late charges, if any, accruing thereon.

Section IV: SURCHARGE ADMINISTRATION AND COLLECTION PROCEDURES

- A. The General Manager may adopt such procedures as may be necessary from time to time for the administration of this ordinance and the collection of surcharge fares; the general manager may provide procedures for a hearing before himself or his delegate for any person liable for a surcharge fare who shall request a hearing in writing within the time allowed for payment of the surcharge fare.
- B. If a surcharge fare is not paid within the time allowed for payment, the General Manager may impose a system of late fees which may increase from time to time as he may determine, provided that the total amount of late fees shall not exceed four times the surcharge fare.

Section V: CONSTRUCTION AND SEPARABILITY

It is the intent of Tri-Met that this Ordinance shall be liberally construed to effectuate its purpose and policies. If any section, subsection, sentence, clause, phrase, or portion of this Ordinance is for any reason held invalid or unconstitutional by a court, Tri-Met desires such portion be deemed, to the maximum extent possible, a separate, distinct and independent provision, so that the invalidity shall not affect the remaining portions of this Ordinance.

It is also the intent of Tri-Met that the remedies provided by this Ordinance for the imposition and collection of surcharge fares shall be civil in nature and shall be cumulative with other remedies both civil and penal, which may be available,

including the enforcement of a penalty provided by Section VI of this Ordinance.

Nothing herein is intended to compromise or waive the right to enforce concurrently, or in the alternative, remedies available pursuant to the Oregon criminal code, including those applicable to the crime of theft of service or trespass.

Section VI: PENALTIES

- A. A violation of Section II of this Ordinance shall be an infraction punishable by a fine of up to \$250.

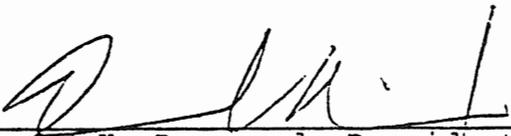
Section VII: ADMINISTRATION AND ENFORCEMENT OF PENALTIES

Citation forms authorized pursuant to ORS 153.110 to 153.310 may be used for any violation of Section II of this Ordinance.

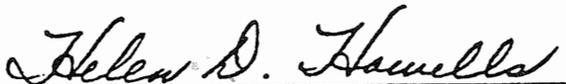
Section VIII: EMERGENCY, EFFECTIVE DATE

The Board of Directors finds there is an immediate need to have a coordinated arrangement with the courts enforcing the amendment included within this ordinance and that an emergency exists. Therefore this ordinance shall take effect immediately upon its passage.

ADOPTED: August 29, 1983


Gerard K. Drummond, President

ATTEST:


Recording Secretary

APPENDIX D

DISCUSSION OF DWELL AND RUN
TIME SURVEYS

DISCUSSION OF DWELL AND RUN
TIME SURVEYS

Data sources for the operating effects study comprised pre-SSFC and SSFC:

- . bus stop dwell time surveys;
- . mall run time surveys; and
- . route dwell time surveys.

Data collection concentrated on the Downtown Transit Mall because the greatest operating effects were expected there.

BUS STOP DWELL TIME SURVEYS

TRI-MET surveys of bus stop dwell times were:

- . in spring 1981, before SSFC and articulated buses;
- . in spring 1982, before SSFC and with articulated buses; and
- . in spring 1983, during SSFC and with articulated buses.

Dwell time surveys were designed to measure the effects of SSFC on bus dwell time. TRI-MET surveyed all bus stops on the Mall that were served by two or more bus lines during:

- . mid-day between 10:00 a.m. and 11:30 a.m.--lunch hour was avoided to eliminate Fareless Square activity; and
- . p.m. peak between 4:30 p.m. and 5:30 p.m.

Observers, positioned at bus stops, recorded the number of the route and the bus, the number of boarding and alighting passengers, estimates of bus loads upon departing a stop, and amount of bus dwell time. Timing began after the bus had completely stopped or the front door was opened. Timing ended with the final boarding or alighting passenger. Surveyors were asked (1) to not count stragglers and passengers boarding while a bus waited for a traffic signal; and (2) to eliminate excessive time spent by drivers giving instructions to riders. To keep the data random, observers only surveyed the first bus when groups of two or more arrived at a stop simultaneously.

MALL RUN TIME SURVEYS

Mall run time surveys were designed to measure the effects on Mall run times of SSFC and articulated buses. TRI-MET surveys of Mall run times were:

- . in Spring 1981, before SSFC and articulated buses;
- . in Spring 1982, before SSFC and with articulated buses; and
- . in Spril 1983, during SSFC and with articulated buses.

TRI-MET stationed observers at both ends of the Mall during the mid-day from 10:30 a.m. to 12:30 p.m. and the p.m. peak from 4:00 p.m. to 6:00 p.m. During mid-day, observers performed checks for all buses (recorded bus line number, bus number, time, and estimated load). During the p.m. peak, because the volume of buses on the Mall was large, observers counted all buses but only checked buses with odd route numbers or lines which used articulated buses. TRI-MET verified the bus counts against scheduled buses and found them to be accurate.

ROUTE DWELL TIME SURVEYS

The route dwell time surveys collected data on dwell and run time along five routes for before and during SSFC. TRI-MET stationed surveyors in buses on selected routes during the a.m. and p.m. peak hours to record dwell time, number of passengers boarding and alighting, and run time. The purpose of the route surveys was to ascertain the probability and extent of future productivity improvements from SSFC.

There are limitations to the data for the following reasons:

- . The difficulty and costliness of collecting sufficient data on selected routes to develop statistically valid relationships limited survey coverage. The small number of routes sampled limits the extrapolation of survey results to TRI-MET's whole network.
- . Despite the effort to focus on transit routes that would not change with SSFC introduction, this objective was not achieved. In a number of cases route cutbacks occurred and the number of stops varied.
- . TRI-MET introduced ADBs during SSFC. TRI-MET found that ADBs increased dwell times because of narrow front ends which increased congestion.

Peat Marwick analyzed this data only in conjunction with other survey results so these limitations do not undermine our findings.

APPENDIX E
FARE EVASION ANALYSES

APPENDIX E

FARE EVASION ANALYSES

TRI-MET conducted a pre-SSFC fare compliance study, an SSFC farebox shortchanging survey, and an analysis of SSFC fare evasion revenue losses.

PRE-SSFC FARE COMPLIANCE SURVEY

TRI-MET conducted its pre-SSFC fare compliance study to determine fare evasion rates and to estimate fare evasion revenue losses. The study comprised three surveys:

- o a cash evasion survey to determine the rates of farebox shortchanging, invalid transfer use, bad cash use (slugs, halved dollar bills), and no payment
- o a pass evasion survey to estimate the use of counterfeit passes and misuse of special fare passes (student or honored citizen)
- o zone fare evasion survey to determine the extent of zone fare evasion

For the cash evasion survey, bus operators recorded the numbers of all cash paying passengers, the numbers of passengers who evaded cash fares, and the type of cash evasion. The pass evasion survey used uniform fare inspectors who carefully inspected all passes displayed by boarding passengers. The zone fare evasion survey used teams of bus operators and inspectors to determine the number of riders who traveled three zones and the number of riders who paid for two zones but traveled three zones. Only drivers who volunteered to assist in the surveys were used.

TRI-MET used a sample size of 5 percent of bus trips which it selected randomly from the runs of drivers who volunteered for the study. (A trip was one-half of a round trip). TRI-MET surveyed trips from 7 a.m. to 6 p.m.

The table below shows the actual trip and rider sampling rates. A 3 percent sample of riders is considered reliable for systemwide analyses of ridership.

<u>Survey</u>	<u>Trip Sampling Rates</u>		<u>Rider Sampling Rates</u>	
	<u>Weekday</u>	<u>Saturday</u>	<u>Weekday</u>	<u>Saturday</u>
Cash Evasion	5.4	4.5	3.9	3.4
Pass Evasion	4.5	2.7	3.7	2.9
Zone Fare Evasion	4.3	2.5	3.8	2.3

SSFC FAREBOX SHORTCHANGING SURVEY

In late May and early June of 1983, TRI-MET conducted a survey of farebox shortchanging and bad cash use during SSFC. TRI-MET undertook the study to determine the extent of fare violations that inspectors were unable to detect.

Bus operators tracked the number of cash riders who shortchanged the farebox and used bad cash. The totals were compared with controller counts to calculate the evasion rate.

SSFC FARE EVASION REVENUE COST ANALYSIS

TRI-MET estimated fare evasion revenue losses during SSFC using data from its annual on-board ridership survey of May 1983. Data from fare inspector logs were not used for the analysis because inspectors were not deployed randomly. The data from the on-board survey was a statistically representative sample of 65,000 riders factored to observed control totals on each trip. The data produced ridership by fare category by day type (weekday, Saturday, or Sunday) which was then multiplied by average fare by category to obtain expected revenues. Expected revenues were compared with actual revenues to calculate revenue losses. TRI-MET subtracted estimates of revenue losses caused by SSFC equipment failures to determine revenue losses caused by fare evasion.

APPENDIX F

DISCUSSION OF ON-BOARD, PANEL, AND HOUSEHOLD SURVEYS

APPENDIX F

DISCUSSION OF ON-BOARD, PANEL, AND HOUSEHOLD SURVEYS

TRI-MET conducted the following surveys for an analysis of rider and non-rider attitudes toward the fare collection system:

- . pre-SSFC rider on-board/mail-back survey (May 1982);
- . SSFC panel survey (March 1983);
- . SSFC rider on-board/mail-back survey (March 1983);
and
- . SSFC household rider/non-rider survey (October 1982).

TRI-MET designed the surveys; the Transportation Systems Center (TSC) and Peat Marwick reviewed them.

PRE-SSFC ON-BOARD SURVEY

In May 1982, the pre-SSFC on-board rider survey was conducted over a two-week period. The survey form comprised two parts:

- . One part was to be filled out on board the bus.
- . The other part, which was to be mailed back within a few weeks, requested additional information as well as names, addresses, and telephone numbers of those who desired to participate in a follow-up survey.

TRI-MET offered riders an incentive of two bus tickets for completing both the on-board and mail-back portions of the survey. TRI-MET offered an additional incentive of five bus tickets to riders who agreed to participate in an SSFC panel survey.

Of the average 167,028 boarding rides (excluding owl service), 8 percent were sampled. Useful responses to the on-board survey accounted for 3.7 percent of average weekday ridership; the mail-back portion accounted for 2.0 percent.

PANEL SURVEY

Of the 1,450 riders who, in the pre-SSFC on-board survey, indicated their willingness to cooperate with TRI-MET in future surveys, nearly 800 participated in the March 1983 panel survey. Data reduction, based on eliminating responses with

excessive weekly trip rates, resulted in 776 usable responses. These data sets were analyzed separately and also in conjunction with matched responses from the initial rider survey.

SSFC ON-BOARD SURVEY

In March 1983, an SSFC on-board rider survey on fare collection was distributed to 9,800 riders. Identical in format to the pre-SSFC on-board survey, 6,300 responses were received to the on-board portion and 4,000 to the mail-back portion. These figures represent nearly 4.5 percent and 2.9 percent, respectively, of the originating ridership. No incentive was provided for completing the survey.

HOUSEHOLD SURVEY

TRI-MET conducted a household telephone survey of 500 riders and 500 non-riders. This survey obtained information on rider and non-rider attitudes toward SSFC and evaluated the success of marketing, promotion, and information dissemination for introducing SSFC. Because this survey was conducted one month after SSFC implementation, it offered an opportunity to obtain transitional attitudinal and behavioral data.

SAMPLING PROCEDURES

Routes and buses on which the on-board rider surveys were distributed were randomly selected within stratifications by day of week and time of day. The sampling process was conducted over a two-week period by surveyors operating in three work shifts: 6 a.m. to 2 p.m.; 2 p.m. to 10 p.m.; and a split 6 a.m. to 10 a.m./3 p.m. to 7 p.m. Surveyors were assigned all day to a sample bus.

The home interview survey was based on a randomly selected sample. Initial questions were used to categorize households into riders and non-riders.

RIDER SURVEY DATA VALIDATION

For the pre-SSFC on-board survey, distributions of returned surveys according to route, geographic, day-of-week, and time-of-day characteristics were compared with actual distributions from TRI-MET's Quarterly Line Performance Report of spring 1982. Table F-1 summarizes the results of this comparison.

TABLE F-1

PRELIMINARY VALIDATION OF RAW RIDER DATA FROM PRE-SSFC ON-BOARD SURVEY WITH TRI-MET QUARTERLY LINE PERFORMANCE REPORT (SPRING 1982)

ROUTE TYPE	QUARTERLY LINE PERFORMANCE REPORT		ON-BOARD SURVEY RESPONSE	
	AVERAGE WEEKDAY RIDERS	PERCENT	RIDERS	PERCENT
REGIONAL	41069	24.6	1646	26.9
URBAN RADIAL	88198	52.8	3022	49.5
PEAK	3586	2.2	114	1.9
LOCAL RADIAL	17392	10.4	914	15.0
FEEDER	16783	10.0	412	6.7

GEOGRAPHIC REGION	QUARTERLY LINE PERFORMANCE REPORT		ON-BOARD SURVEY RESPONSE	
	AVERAGE WEEKDAY RIDERS	PERCENT	RIDERS	PERCENT
EAST	103300	62.5	3897	63.8
SOUTHEAST	8670	5.2	507	8.3
SOUTHWEST	23274	14.1	884	14.5
NORTHWEST	8933	5.4	104	1.7
WEST	21062	12.7	716	11.7

DAY-OF-WEEK	QUARTERLY LINE PERFORMANCE REPORT	ON-BOARD SURVEY RESPONSE
	PERCENT OF RIDERS	PERCENT OF RIDERS
WEEKDAY	89.8	84.7
WEEKEND DAY	10.2	15.3

Source: TRI-MET Bus Rider Survey, May and June 1982 (On-Board)

Characteristics of riders returning surveys closely approximated actual ridership characteristics, with two exceptions:

- . weekend riders were over-represented as compared with weekday riders; and
- . feeder bus route riders were under-represented, while local radial routes were over-represented.

TRI-MET suggested that the lower survey response rate from feeder bus riders might be due partly to relatively short average travel distances. Such riders had limited time in which to complete an on-board survey.

Validation of the SSFC on-board survey on a similar basis was not possible as system ridership totals were not available after the summer of 1982. However, because the same sampling methodology was applied for both before- and during-SSFC rider surveys, the sample was assumed to be representative of actual TRI-MET ridership.

To discuss attitudes in the proper context of riders rather than trips, the problem of trip frequency bias encountered in all on-board rider surveys was addressed by applying TSC corrective statistical procedures.*

To gauge how representative the various rider surveys were of the actual TRI-MET rider population, demographic data were collected (Table F-2). Distribution of gender, age, and income differed for on-board, panel, and household survey samples. Of these, the panel survey reflected a relatively higher concentration of riders who were older and who had higher incomes. Therefore, panel survey questions that exhibited a relationship to rider income or age needed careful interpretation.

* L.B. Doxsey, Respondent Trip Frequency Bias in On-Board Surveys, Mimeographed Paper, Transportation Systems Center, U.S. Department of Transportation, December 1982.

TABLE F-2

**TRI-MET BUS RIDER SURVEY DEMOGRAPHIC DATA
(Before and During SSFC)**

CHARACTERISTICS	BEFORE SSFC		DURING SSFC			
	ON-BOARD (%)	MAIL-BACK (%)	ON-BOARD (%)	MAIL-BACK (%)	PANEL (%)	HOUSEHOLD (%)
GENDER						
MALE	43	41	45	45	33	41
FEMALE	57	59	55	55	67	59
AGE						
15 OR UNDER	5	4	6	3	1	12
16 TO 24	34	28	33	25	20	22
25 TO 44	35	36	38	44	49	33
45 TO 64	16	19	12	15	17	15
65 OR OVER	10	13	11	14	13	18
INCOME						
UNDER \$5000	27		26		15	} 38
\$5000 TO \$9,999	15		26		14	
\$10,000 TO \$14,999	19		15		15	
\$15,000 TO \$24,999	17		18		22	15
\$25,000 OR MORE	22		23		35	22

SOURCE: TRI-MET Bus Survey, May and June 1982 (On-Board/Mail-Back)
 TRI-MET Bus Rider Survey, March 1983 (On-Board/Mail-Back)
 TRI-MET Panel Survey, March 1983
 TRI-MET Household Survey (Riders Only), October 1982 - 500 Riders

400 copies

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